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The Hon. Peter White.

A Biographical Sketch of the Lake Superior Iron Region.

PART I.

PROLOGUE.

This is the story of a man's life. But what a life it has been and is. The tale will be told as simply and as succinctly as possible, but if there be digressions in the narrative it will be because the theater in which the life has been spent is so stupendous as to compel them. When a man's life is linked with a country it is impossible to chronicle it without chronicling the history of the country. In all new countries there is one man who typifies the region; and while gigantic figures have moved across the face of this marvelous panorama there is none so singularly attractive as he who is the central figure of this rapid sketch. For he is the very embodiment of the spirit of the country in which he lives. Its sheer ruggedness is in his frame as though out of the metal-shot soil he had absorbed the iron of his constitution. If you will take any man who has lived close to nature you will find the most splendid specimen of manhood to be found anywhere. Nature is open, frank and earnest, sometimes terribly so, but always genuine. The men who lie closest to her have these self-same attributes. Their simplicity is charming. Take a man whose life has been with the elements and he is invariably without guile. The men who opened up the American frontier were these sort of men. Buffalo Bill and Wild Bill are examples. They stood for law and order and would have it at the price of life. They were the advance guard of civilization. They made it possible for decent men and women to live on the edges of a wilderness. It is a pity that the yellow-backed novelist has been their only biographer; but some day the white light will beat upon them and will reveal them as they really are.

PETER WHITE IN 1857.

While this is a frontier story there is neither blood nor thunder in it. It is not lacking, however, in the element of romance. Indeed it would be impossible to find in real life a more romantic tale. As a work of the imagination there is nothing comparable to the Count of Monte Cristo in the realm of romantic fiction. One is held in thralldom by the unlimited wealth of this creature of fiction. Money is the talisman to which all doors open and to which all achievements are possible. It is easy, therefore, to comprehend the fascination which this story possesses. There is but one other attribute open to the romancist which occupies a like hold upon the mind—and that is the possession of unconquerable physical strength. Hugo utilized this in his character of Jean Val Jean. What then is to be said of this story when its base has a wealth which is far greater than that which Dumas could possibly have credited to Edmond Dantes and when the very country breeds men whose powers of endurance rival those of Hugo's hero. Has it not the elements in it out of which to weave the fabric of the great American novel so long expected and so long delayed?

For the story is distinctly American. Indeed there is nothing more distinctly American, though it might have been a Canadian tale had it not been for the foresight of the great Benjamin Franklin, who deflected his pencil a bit upon a certain memorable occasion and caused the upper peninsula of Michigan to be included within the American boundary. Franklin did a great many things for his country which dwell more or less freshly in the memory of posterity; but this one thing, long since forgotten, if indeed ever adequately comprehended, was in a material sense the greatest of them all. It was the vague report of mineral wealth in that unbroken region which caused his pencil to make the almost imperceptible deflection upon the map.

For long years, for centuries, it had been known that that region was rich in metallic substances. Copper was the one metal known to exist in great quantities. However, the world may as well not have known, for it never took advantage of the information. The country was too vaguely fixed in its imagination to have a commercial value. As early as 1636 La Garde, in a little book published in Paris, made known the existence of copper in that far country by the unsalted seas. The Jesuits, too, in the recital of their missionary work, which extended from 1632 to 1672, frequently speak of the existence of copper. Claude Allouez, whose contributions are the most valuable upon the subject, visited the Lake Superior region in 1666. He makes mention of a large mass of native copper which was plainly visible near the shore of the lake and relates that the Indians who passed that way, cut pieces from it. Indeed he says that the Indians frequently had pieces of copper weighing from 10 to 20 lbs. and that they held the specimens in superstitious awe. A map was drawn of this region by these zealous missionaries in 1672, which, to this day, is electrifying in its accuracy. However, the observations of the Jesuits are important from the historical standpoint only; in the commercial development of the region they play no part whatever. It would be interesting to pursue them further were it not for the fact that the present story has to do with a personality whose blood still runs red in his veins.

The first attempt at development was made as the result of an account of the mineral deposits made by Capt. Jonathan Carver, who visited Lake Superior in 1765. His story so captivated Alexander Henry, an Englishman of venturesome spirit, that he organized a company to exploit the resources of the region. Many of the nobility went into the venture and even the King of England became a stockholder. Henry actually began mining operations on the Ontonogan river in 1771 and succeeded in mining a great deal of copper. He also secured an ore which contained a great deal of silver. The enterprise was remote from the market and notwithstanding the acknowledged value of the deposit it was abandoned. The English investors decided that copper was not sufficiently precious a metal to bear the cost of transportation over such vast distances, and even Henry became of the opinion that the country would have to be peopled before the copper could be profitably mined. This adventurous spirit then undertook that series of exploits which have inseparably linked his name with the history of Mackinac island and which makes his character a striking one both for the novelist and dramatist.

Incredible as it may seem, this region, richer in actual value to mankind than any other section of this great round globe, lay dormant for nearly a century after Henry's luckless venture. The world, lustful for gold as it is, apparently forgot all that had been written about it. Even Michigan, when it was admitted into the union as a state, protested against the inclusion of the upper peninsula within her borders. She actually had to be bribed to take it. The Lake Superior region, in a commercial sense, is only fifty years old. This is an incontestible but stupendous fact. It brings its entire development within the life of our subject and is the very circumstance which gives to his career its magnificent setting. No other man has moved so continually upon such a stage. It is simply Titanic.

Posterity will forever owe a debt to Dr. Douglas Houghton for the work which he did as the first of Michigan's state geologists. He traversed the south shore of Lake Superior during his investigations five times in a birch bark canoe, and his practiced eye saw at once the great mineral wealth that was awaiting the hand of man. He stated his observations in his report to the government in the most guarded language, for while he recognized as a scientist the wealth of the region, he was conscious also as a practical man of the hazard of its development. He had no mind to lure men to their ruin. The peninsula in those days was a veritable Klondike from the standpoint of inaccessiblity. His report of 1841 was careful, painstaking and conservative, but notwithstanding its tone men flocked to the region by thousands. Dr. Houghton had foreseen this condition, and his heart was wrung for them, for he knew that only a tithe could possibly hope to win success. Indeed claims were abandoned as soon as they were located and in a few years most of the prospectors had left the country. Dr. Houghton's report was largely devoted to copper. Of iron he makes only the merest mention, which is not surprising, as his investigations were confined to the shore of the lake and none of the iron deposits come within seven miles of it. Dr. Houghton was an extraordinary man of fine moral and mental fiber. His geological observations of the region are today universally accepted, though it took the later generation of geologists several years to come to his conclusions. The rocks are very old. They precede organic life. They are the result of a great cataclysm and however deep one descends into the earth there is no heat. Dr. Houghton was an intrepid man, and to this very intrepidity he owes his untimely end. For if any man's end

was untimely it was Houghton's. He was in the full flush of manhood. He had achieved much and was bound to achieve more. When he died Gov. Cass said the state had better have lost ten millions of dollars. The wind was freshening at dusk when Dr. Houghton decided to make Eagle harbor and told his man, Peter, to embark with him in the canoe. Peter was a half breed and born to his calling, which was to navigate the treacherous father of lakes in a birch bark canoe. He demurred at the suggestion, and when Dr. Houghton insisted frankly stated that it was not safe.

"Tut, tut, Peter," replied Dr. Houghton, "we can get into the harbor all right."

Peter shipped the canoe and the two started out. Night fell upon them and the sea rose. The Indian battled with it bravely and silently, but little progress was made. Dr. Houghton finally saw that it was impossible to make headway and ordered Peter to put back. But it was too late. A giant wave capsized the frail canoe. Seizing the canoe with one hand, the Indian caught Houghton with the other.

"Take care of yourself, Peter," sang Houghton cheerily, "I can take care of myself."

"Let me go, I say," he added a moment later when he saw that the Indian had not released his hold.

Peter reluctantly let him go and after a long struggle succeeded in grasping the branches of an overhanging tree. This was the night of Oct. 13, 1845.* The body of Dr. Houghton was not found until the following spring. The field notes, found in his clothing, are almost priceless possessions today.

The fact that Dr. Houghton made no mention of iron in his report is significant in that it shows conclusively that the Indians could have had no traditions concerning it. This is important because it brings the discovery of iron within the memory of men now living and relieves it of conjecture and surmise. Of copper it is impossible to determine who first discovered it. There was a people who antedate the present race of Indians that knew of its existence and had uses for it. These people lived and died long before Columbus discovered America, and while the Indians have neither legend nor tradition concerning them the fact that they lived is proved in the mute testimony of nature. Lying about some of the copper mines were stone hammers; underpinning masses of native copper were wooden props in such a state of decay that centuries must have been required in the process; but, above all, out of the thrown up earth of these early mines, trees had grown, had fallen and decayed and had grown again, marking the centuries with the rings upon them. Of this crude but industrious race the Indians had no knowledge.

But with iron the story is different. It is only a little while ago. Iron was first discovered by William A. Burt, United States deputy surveyor, and party, who were engaged in surveying the upper peninsula. In the party were William Ives, compass-man; Jacob Houghton, barometer-man; H. Mellen, R. S. Mellen, James King and two Indians named John Taylor and Michael Doner. While running the east line of township 47 north, range 27 west, they observed on Sept. 19, 1844, by means of the solar compass the most remarkable variations in the direction of the needle. These fluctuations greatly excited Mr. Burt, who was the inventor of the solar compass, and when the compass indicated a variation of 87° he could contain himself no longer.

"Boys," said he, "look around and see what you can find."

Each member of the party began an independent search and found outcroppings of iron ore in great abundance. In fact they could not fail to find it for a mere rip in the sod revealed the ore. Mr. Burt was well advanced in life and was much more interested in the performance of his compass than he was in the deposits of ore themselves.

"How could they survey this country without my compass," he exclaimed, and after the manner of an old man, he repeated the remark a score of times.

It is worthy of note that no member of this party of surveyors made any effort to profit by the discovery. It does not seem to have occurred to any of them to preempt one of the locations. They noted in their report and on their maps that iron existed—and that was all. The cause of this indifference doubtless lay in the knowledge of the almost insuperable obstacles which would have to be overcome before the iron could reach its market. However, it is strange that none of them recognized the fact that time was the only asset required to make them wealthy.

The work which William Ives did upon this survey was unusually faithful and historically important. He performed it with the utmost care and diligence, and indeed overcame many physical obstacles which would have daunted a less courageous spirit. At one time, being wounded badly in one foot, the party had to leave him at the mouth of Carp river. The next day Ives appeared among them at what is now Negaunee, having traversed the entire distance upon a pair of improvised crutches. Any one who has traveled over the face of this tremendously convulsed country will appreciate the heroism of this performance.

The point at which the ore was indicated by the magnetic needle was not the point at which the ore was first actually mined, because the ore first mined was not magnetic. It is a further singular circumstance that the knowledge of the discovery, made by the surveyors, while duly recorded in their reports, seems not to have been known by anyone who could profit by the information. They related the discovery to the Indians whom they met, but it seems not to have reached the ears of any white man. Among those to whom they made mention of the existence of iron was Louis Nolan, a half breed, living at Sault Ste. Marie, and an old Indian chief named Manjekijik, whose wigwam was at the mouth of the Carp river.

In the spring of 1845 P. M. Everett of Jackson, Mich., excited by the reports of the existence of copper and silver in the Lake Superior region, made a journey into that country accompanied by four men. When he reached Sault St. Marie he met Louis Nolan, who related to him the discovery of the iron deposits by the surveyors and volunteered to show him the way. Everett had not heard of iron, but he accepted the offer of Nolan and employed him as guide. Nolan was a physical giant, as hard as a rock, and proved an invaluable servant. He escorted the party as far as Teal lake, but was unable to locate the iron deposits. Everett then started for Copper Harbor, but on the journey thither fortunately fell in with Manjekijik, the old Indian chief, to whom they related their fruitless search. He at once undertook to show them the deposits and piloted them directly to the Jackson mountain and then to the Cleveland mountain. These terms, Jackson and Cleveland, are used because it was by these names that the deposits were later known. Manjekijik's superstition regarding the deposits was such that he would not approach them directly, so that the actual discovery of the Jackson deposit was made by two members of Mr. Everett's party—S. T. Carr and E. S. Rockwell. In reward for the services of the Indian on this occasion the officers of the Jackson company subsequently gave him a written stipulation of which the following is a copy:

River du Mort, May 30, 1846.

This may certify that in consideration of the services rendered by Manjekijik, a Chippeway Indian, in hunting ores of location No. 593 of the Jackson Mining Co., that he is entitled to twelve undivided one-hundredths part of the interest of said mining company in said location No.

A. V. BERRY, Superintendent.
F. W. KIRTLAND, Secretary.

This agreement on the part of the company was never fulfilled and Manjekijik finally died in poverty. The white man's trail is frequently one of perfidy. However, it is true that none of the original members of the Jackson Mining Co. got anything out of their holdings and Manjekijik therefore fared upon an equal basis with them. But this is overstepping the development of the story.

Everett's party had a number of permits in their possession, issued by the secretary of war, to preempt mineral locations, and one of them, made out to James Ganson, was used upon the Jackson location. The party then gathered up a little of the ore and returned to Jackson, Mich., with it. The following spring another expedition was fitted out by the Everett party, consisting of F. W. Kirtland, E. S. Rockwell, W. H. Munroe and A. V. Berry, to visit the Jackson location. They built a house upon it and returned to the mouth of the Carp river with 300 lbs. of ore upon their backs. Some of the party remained behind to keep possession of the location, but Berry journeyed on to the Sault with the ore. At the Sault he met J. Lang Cassels of Cleveland, a noted mineralogist, who had been sent into the peninsula by a number of Cleveland gentlemen to report upon its mineral resources. These gentlemen were anxious to develop the mines should any of promise be found. Berry, learning that the men whom Cassels represented were of the highest integrity, made known the Cleveland location to him, on condition that expenses of keeping possession and making roads should be borne jointly. Dr. Cassels took Berry's canoe, visited the location and secured it by a permit. Berry proceeded to Jackson with his ore, where he made two attempts to smelt it in a cupola furnace and failed. Some of the ore was then taken to Mr. Olds of Cucush Prairie, who succeeded in making a fine bar of iron from it in a blacksmith's fire, the first iron ever made from Lake Superior ore.

In the summer of 1847 the Jackson company constructed a forge on Carp river about three miles from the mine and on Feb. 10, 1848, the first iron ever made in the Lake Superior region was made in this forge by Ariel N. Barney. A month later the forge went out of commission, being carried away by a freshet. Mr. Everett returned in the summer of 1848, repaired the dam and resumed the manufacture of blooms. The first iron made was sold to E. B. Ward, who used it in the walking beam of the steamer Ocean. The forge had four fires, from each of which a lump was taken every six hours, which was placed under the hammer and forged into blooms 4 in. square and 2 ft. in length. The daily product was about six tons, requiring two teams of six horses each to convey the blooms to Marquette, which lay ten miles away. The roads were of unvarying horror and break-downs were frequent. The same difficulty which attended the getting of the blooms to port attended the getting of supplies to the forge—the ore and charcoal. After struggling with insufficient power, for sometimes the Carp river ran pretty low, with the frightful grades and the unspeakably bad roads the forge met the death to which it was born.

*This occurrence is related as told by J. M. Stiles of Marquette last summer.

Meanwhile there lived at Mackinaw a man, one-quarter of him Indian, his mother being a half breed, who was destined to give the central figure of this story a prodigious start in life. His name was Robert J. Graveraet Of him it might be said as Hamlet said of his father:

> The front of Jove himself—
> An eye like Mars, to threaten and command,
> A station like the herald Mercury,
> New lighted on a heaven kissing hill,
> A combination and a form indeed
> Whereon each god did seem to set his seal
> To give the world assurance of a man.

Graveraet was not an ordinary man. He would be singled out as a natural leader among thousands. He was ambitious; he had a will of iron; he had the faculty of winning men; he was generous, gentle, but firm; he had great intelligence and energy; and his Indian mother had given him a constitution that did not know the meaning of fatigue. For grace of bearing and beauty of proportion Graveraet challenged instant admiration; and, moreover, his muscles were of steel. This man recognized more quickly than any of his associates the immeasurable value of the iron deposits. He believed that he had a claim upon two of the most valuable of them—the Cleveland and the Lake Superior—and he induced John H. Mann and Samuel Moody to undertake their pre-emption. How sadly he was mistaken regarding his priority of right will later be revealed. In the summer of 1848 Graveraet met at Mackinaw Mr. Edward Clark of Worcester, Mass., a representative of Mr. Waterman A. Fisher of Worcester, who had become interested in the accounts of the mineral wealth of the region and who had sent Clark to investigate. Fisher was the proprietor of a cotton factory and was reputed to be a wealthy man, as wealth was accounted in those days. Clark, like all the rest, was on the copper scent until he fell in with Graveraet. Graveraet induced him to stop at Carp river to inspect the iron mines. He took him to the Cleveland and Lake Superior locations, where Moody, Mann and Rogers were holding possession, and showed him the apparently inexhaustible deposits. He also took him to the Jackson forge and gave him a bloom of iron and some ore. Clark returned to Worcester, where the iron was drawn into wire at a factory and proved most excellent. He had no trouble in enlisting Fisher's aid in developing the iron mines. Graveraet, too, appeared upon the scene in the early winter, having made the journey from Marquette to Saginaw on snow shoes. Graveraet had perfect mastery over his physical resources and a journey of this character was as nothing to him. Fisher was charmed with the man. He readily assented to advance the necessary capital, Graveraet offering as security leases from Moody and Mann upon the Cleveland location and from Rogers upon the Lake Superior location. A. R. Harlow of Worcester, a practical mechanic, was also induced to join forces and he accordingly constructed the necessary machinery for a forge. In March, 1849, the Marquette Iron Co. was organized, consisting of W. A. Fisher, A. R. Harlow, E. B. Clark and R. J. Graveraet. It was decided to ship the machinery to Marquette as soon as it should be finished and Harlow was to follow immediately thereafter. Graveraet returned at once to Mackinac island to engage a number of workmen for the mines, because, beyond the pre-emptors, there were no white men whatever in the Lake Superior region. He had no difficulty in enlisting the aid of ten men, though to all accounts the region to which he invited them was as bleak and barren as the proverbial wilderness. In April, 1849, Graveraet and his party set forth for the promised land in the little steamer Tecumseh. At the Sault they transferred their few belongings to a Mackinaw barge, and after eight days of rowing, towing, poling and sailing reached Carp river and anchored at Indian Town, now known as Marquette. The first person to greet the little party was Charley Bawgam, a full blooded Chippeway Indian, lithe as a sapling, and in the prime of life. This Indian is living yet, now nearly 100 years old, and almost blind. He invited the party into his cedar wigwam and his wife cooked a fine supper of fresh venison, wild duck, geese, fresh white fish, potatoes, bread and coffee. Bawgam, savage though he was, knew how to live.

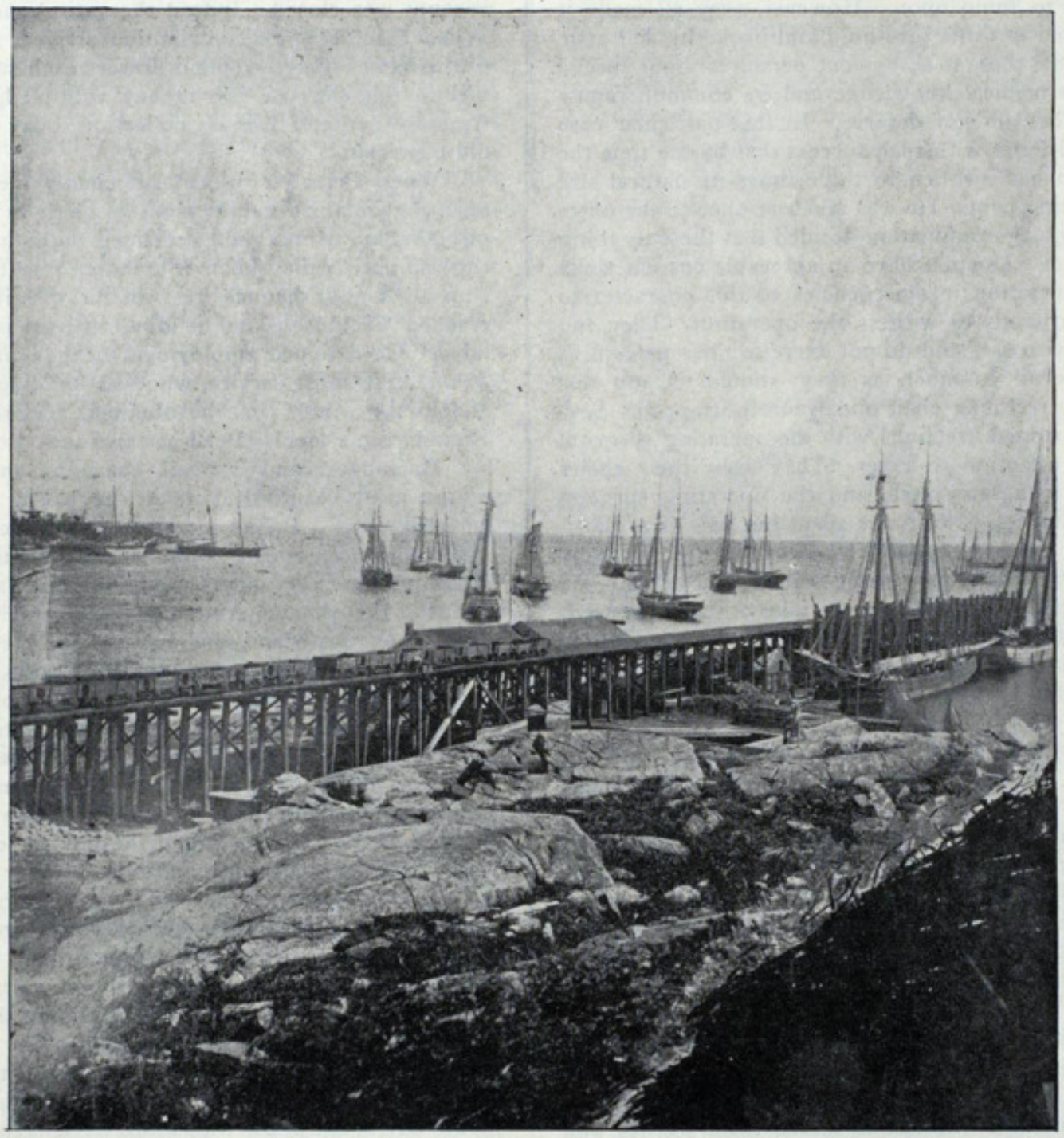
The next morning Graveraet gave each member a pack strap and blanket and directed him to use his own discretion in putting into the pack what he thought he could carry a distance of twelve miles up hill. Graveraet put into his own pack more than twice the quantity that any other member of the party could carry, and thus equipped the caravan started for the much-discussed iron hills. When they had journeyed about two miles Graveraet observed that one member of the party, a well-formed though slender lad, was staggering under his load, and as he passed him whisked it from off his shoulders and threw it upon his own much heavier one as though it had been a feather. Even then the lad had difficulty in keeping up with Graveraet's giant strides.

"Jump on my shoulders, Peter," invited the leader.

There was not doubt of Graveraet's ability to carry Peter, pack and all, but the boy's pride was a bit wounded. When the party halted at a little brook for lunch, Graveraet again reached for the stripling's pack after lunch was over.

"I will carry my own pack, sir," said Peter.

He has been carrying it ever since and several others along with it. And thus we meet our hero—Peter White of Marquette—who, man and boy, has had the most fascinating career of anyone who has ever been identified with the history of the region of the great father of lakes. The theme is fruitful.



MARQUETTE IN 1863, SHOWING THE TYPE OF ORE CARRIER THEN PREVAILING ON THE LAKES.

CHAPTER I.

Peter White was born at Rome, Oneida county, New York, October 31, 1830. He remained in that town for nine years, when his family removed to Green Bay, Wis. Up to his fifteenth year nothing particular happened. Peter was just an ordinary boy, going to school and soaking into his system such knowledge as a boy could get. The piping school-boy times, however, were not to his liking and he started out to make his own way in the world. He might, indeed, be called a fifteen-year-old runaway. At any rate he did not see a relative again for ten years. The world's base at that time to him was Mackinac island, whither he went. It was just when the copper excitement was at its height and the imagination of Peter was greatly inflamed by it. In a little while he left for the Sault in the hope of reaching the promised land. He arrived at the Sault on the very day that James Schoolcraft was murdered and found the little settlement in a perfect turmoil of excitement over the crime. It was popularly supposed that the murder was committed by John Tanner, a strange and eccentric character, whose house had been burned down two days preceding the murder and who had mysteriously disappeared.* Peter

*This murder is even today shrouded in impenetrable mystery. James Schoolcraft was the leading man at Sault. Ste. Marie. While walking in slippers and easy gown through a clearing on his own grounds he was shot through the heart by someone hidden behind a clump of bushes near by, the passage of the bullet being distinctly cut through the foliage. The wadding of the gun was found close by on the ground and proved to be a leaf torn from a hymn book used at the Baptist mission chapel services. Tanner, known as "Old Tanner," was usually employed to interpret the sermons in the Sunday afternoon meetings which were conducted in the Indian language. He had a violent and absolutely uncontrollable

endeavored to obtain passage on the schooner Merchant for the copper country, but they would not let him work his passage, and as he had no money he could not go. If he had gone this story would never have been written, because the Merchant never reached her destination. She sank with all on board. Peter returned to Mackinac island and from there set out for Detroit. He secured employment on the schooner Bela Hubbard, plying at that time between Detroit and Sault Ste. Marie, and had probably made about half a dozen trips when the schooner capsized off Thunder Bay island. Fortunately no one was drowned. After considerable buffeting they managed to reach the island and were taken to Bay City by the propeller Chicago. The crew volunteered to work their passage back to Detroit and were all engaged. Before shipping, however, they obeyed the natural instinct to see what manner of place Bay City might be and improved the few hours of daylight in that pursuit. In returning to the vessel after dark they had to crawl over piles of lumber 20 ft. high, which, with the natural altitude of the dock, made the deck of the Chicago below a somewhat indistinct mark to jump upon. However, they all made it well except Peter. He jumped into the fore hold and broke his left arm. In all such primitive settlements there is always one person without special training who makes claim to medical knowledge and by common repute obtains a reputation which they do not deserve. In this particular case it was a woman who attended Peter with such success that by the time the boy reached Detroit the arm had swollen to three times its natural size and was giving him excruciating pain. He was taken at once to the office of a physician, who after a cursory examination decided that the only thing to do was to amputate the arm. Doctors have an agreeable custom when proceeding upon a capital operation in emergencies of this character to invite a number of fellow surgeons to witness the operation. They too frequently gather merely as witnesses and do not exercise their perceptive faculties on the patient's behalf as much as they should. Upon this occasion Peter was put into a reclining chair and securely strapped. Several doctors entered and exchanged greetings with the operating surgeon, but none of them paid any attention to Peter. They drew their chairs about and gathered around in a semi-circle and the operating surgeon proceeded to select his instruments. Peter was silent but pale as a ghost. Presently there entered the room a surgeon whose reputation, already wide, was soon to become national. His name was Zina Pitcher. He did not, as had those who preceded him, merely take a seat, but went immediately to the patient and examined the arm. It was frightfully swollen. He asked the operating surgeon if any steps had been taken to reduce the swelling, and the surgeon, of course, replied in the negative.

"We cannot tell anything about the condition of the arm until the swelling is reduced," said Dr. Pitcher. "I think it would be well to delay the operation for a couple of days."

He gave instructions that hot whiskey and water, as hot as it could possibly be borne, should be poured upon the arm at fifteen minutes' intervals during the next twenty-four hours. The effect of this treatment was wonderful. When Dr. Pitcher called twenty-four hours later the swelling was greatly reduced. He ordered the treatment continued for twenty-four hours longer and the arm had by that time almost regained its normal size.

"My boy," said Dr. Pitcher, "I don't believe we'll amputate this arm at all."

He securely fastened Peter into a chair, and, working with the utmost rapidity, while the youngster screamed with pain, he pulled the bones into place and put the arm in splints. Peter carried his arm in splints for four months, but at the end of that time it was a good arm and is a good arm yet.

Some years later Dr. Zina Pitcher died and was borne to an unmarked grave. The Detroit papers, conscious of the man's greatness, suggested the advisability of a public subscription to erect a monument over his resting place. This petition fell under the eye of Peter White, who immediately subscribed to the fund. He never received acknowledgement of the receipt of his money. This, however, was not the fault of the paper. It was promptly acknowledged though the issue in which it was acknowledged did not reach him. But as a matter of fact Peter White's money did not go into the monument, but was devoted to a far more tender and beautiful purpose. His contribution from Marquette, owing to the uncertain mail service of those days, did not reach Detroit until the subscription account was closed. Indeed the entire amount was subscribed in a day. When Peter White's contribution arrived, a florist, noting the eloquence of the letter, offered to plant flowers each succeeding year upon the grave, and to this purpose the money was pledged. One of the most-prized treasures in Peter White's collection today is a photograph of this sturdy old physician.

When Peter's arm had sufficiently mended to permit him to work again he obtained employment as clerk in the store of Freeman & Bro. on Jefferson avenue and remained with the firm for nearly a year. He then shipped with a man who was going to keep the government lightship at Waugoshaunce reef in the Straits of Mackinac, but when he reached Mackinac island he found that the place which he sought had been filled. He obtained employment in the summer time with Capt. Canfield of the light-house service, who was building a crib at Waugoshaunce reef, and in the winter time he obtained a clerkship in the store of Edward Kanter with a much valued permission to go to school.

Mackinac island is small, charming and highly romantic. It is one of the most beautiful spots in the world. It rises abruptly out of the emerald water. It has a superb pebble beach, guarded by overhanging cliffs of craggy rocks, trimmed with exquisite evergreens, but its great attraction lies in its intense humanity, for its government has been Indian, French, British and American in succession. Peter White spent two years upon this island, and now, as the president of the Mackinac island state park commission, can look back with pleasure upon those years.

Samuel K. Haring was the collector of customs of Mackinac island. In such a small community, where population is only a household, there is much interchange of thought and confidence. Haring took an interest in Peter, his hopes and his ambitions, and when Robert J. Graveraet appeared upon the island in search of men to develop the iron mines of Lake Superior, Haring urged the boy to join the expedition. Graveraet was offering $12 a month and board; Peter was making $35 a month and board; but Haring, who was a man of remarkable foresight and who clearly saw the advantages such a youth would have in a country capable of untold development, urged him to go. So Peter, eighteen years old, offered his services to Graveraet and started out upon his life's work. There followed the tempestuous voyage in the worthless little side-wheeler Tecumseh. The party had gone but a few miles from Mackinac when a huge wave took off the yawl boat, swept the decks clear of freight and sent Capt. Pratt scurrying back into the harbor again. The next day the boat started out again with more passengers than it could either sleep or feed, for it was not intended that the vessel should take over twelve hours in making the trip to Sault Ste. Marie. After an heroic struggle the boat finally got inside of the Detour and there met with such solid ice that she had to back out again. It took the boat ten days to literally hammer her way to the Sault. Meanwhile the supply of food had become exhausted and an incipient bread riot occurred. This was quelled, however, by the boat actually sinking to her deck, furnishing an excitement that temporarily banished hunger. There was on board an old man, nicknamed Old Saleratus, who was the butt of every gibe and jest, but he proved the ship's salvation, for his trade was that of ship carpenter. He found the leak and stopped it.

Then followed the trip in the Mackinaw barge to Indian Town, which has previously been noted, and the march to the iron hills where Peter at the little brook resolutely picked up his own pack and carried it the rest of the way. He dropped it at the Cleveland mine, which was then known to the little party only as Moody's location. The tramp had been a long and weary one. The country was jagged, broken and mountainous, densely wooded and thick with underbrush, with only a tree blazed here and there by the Indians to guide the way. There is not in the Lake Superior region the even sweep of range and canyon, as in the far west, which frequently affords level stretches for the traveler. It is a constant grade which wearies the lungs as much as it does the legs. Peter was tired when he dropped his pack.

Samuel Moody and John H. Mann, who had spent the previous winter and summer at the location, came out of a little log shanty to welcome Graveraet. They were keeping possession for this indomitable soul The party was exhausted and lost no time in getting to bed, but Peter was up betimes in the morning. He found Capt. Moody already stirring.

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temper. The children of his first wife, who was an Indian, could not live with him, owing to ungovernable fits of rage; his white wife, whom he married at the Sault, left him after a life of abject terror with him. She was aided in her flight by the citizens of Sault Ste. Marie, then nothing but a military post, and went to her old home at Detroit. Tanner's rage and grief were frightful to behold. He went to Detroit and tried to pursuade his wife to return. Failing in this he returned to the Sault, permanently saddened and vengeful in the extreme. He nursed his enmity in characteristic Indian fashion, and when under the spell of frequent paroxysms of rage threatened to kill all who had spirited his wife away. There is no doubt that during these periods Tanner was totally insane. His life was full of romance. He had been stolen while a baby by a tribe of Indians and had grown up with them. He was supposed to be an Indian, and, indeed, until late in life Tanner believed himself that he was Indian. He was, however, white. His hair was flowing and iron gray in color, and his countenance, save when he was angry, was one of majestic repose and strength. He was the "bogey man" of the little settlement, and an unruly child was always quieted by the mere suggestion that Tanner would get her if she didn't keep still. Shortly before the murder Tanner became so menacing in his mien that a public meeting was called to see about incarcerating him for the public safety. Two days before the murder Tanner's house, which stood a little below the Indian agency on the banks of the river, was burned down. The report was spread about that he was burned to death in the house, but a careful search failed to reveal any trace of his apparel or bones in the ruins. The incontestible fact remains, however, that Tanner was never seen afterwards. When the murder was committed Tanner was accused of the crime and searching parties were organized to find him. They searched the woods north of the Sault but found no trace of him. There were many stories of his being seen, and an armed guard patroled the mission grounds every night for two months thereafter. The summer became known as the Tanner summer, and no one passed a tree in a dark night who did not glance nervously behind it for fear Tanner might be there. A few years later, when the Mexican war broke out, Lieut. Tilden, stationed at the Sault, was ordered to the front. He was tried in Mexico by court martial for some offense, and during the trial it was hinted that he was suspected of the murder of James Schoolcraft at the Sault. As this report was likely to affect the verdict of the court martial Lieut. Tilden wrote to Rev. Mr. Bingham at the Sault and asked him to circulate a petition among the citizens exonerating him from this suspicion. The minister took the petition to Judge Samuel Ashman, who promptly declined to sign it on the ground that he was not satisfied that Lieut. Tilden was not the guilty man after all. The minister was greatly surprised. He approached Capt. John McKay and found that McKay was also of the opinion that Tilden had committed the crime. Further investigation proved that this impression was general among a certain class of citizens, and that it was even shared by some members of the Schoolcraft family. It seems that shortly before the murder Schoolcraft and Tilden had had a serious dispute and had parted in great anger, Tilden exclaiming that "cold lead would settle it." There was also a report that Tilden was in love with Schoolcraft's beautiful Indian wife. However, the great mystery has never been solved and never will be. There is today in Peter White's library in Marquette a portrait of Tanner—a virile and striking face.

"Come and help me dig some potatoes, boy," said he.

"What?" exclaimed Peter, who, with the snow scarcely off the ground, knew that it was not the time to plant potatoes, much less dig them.

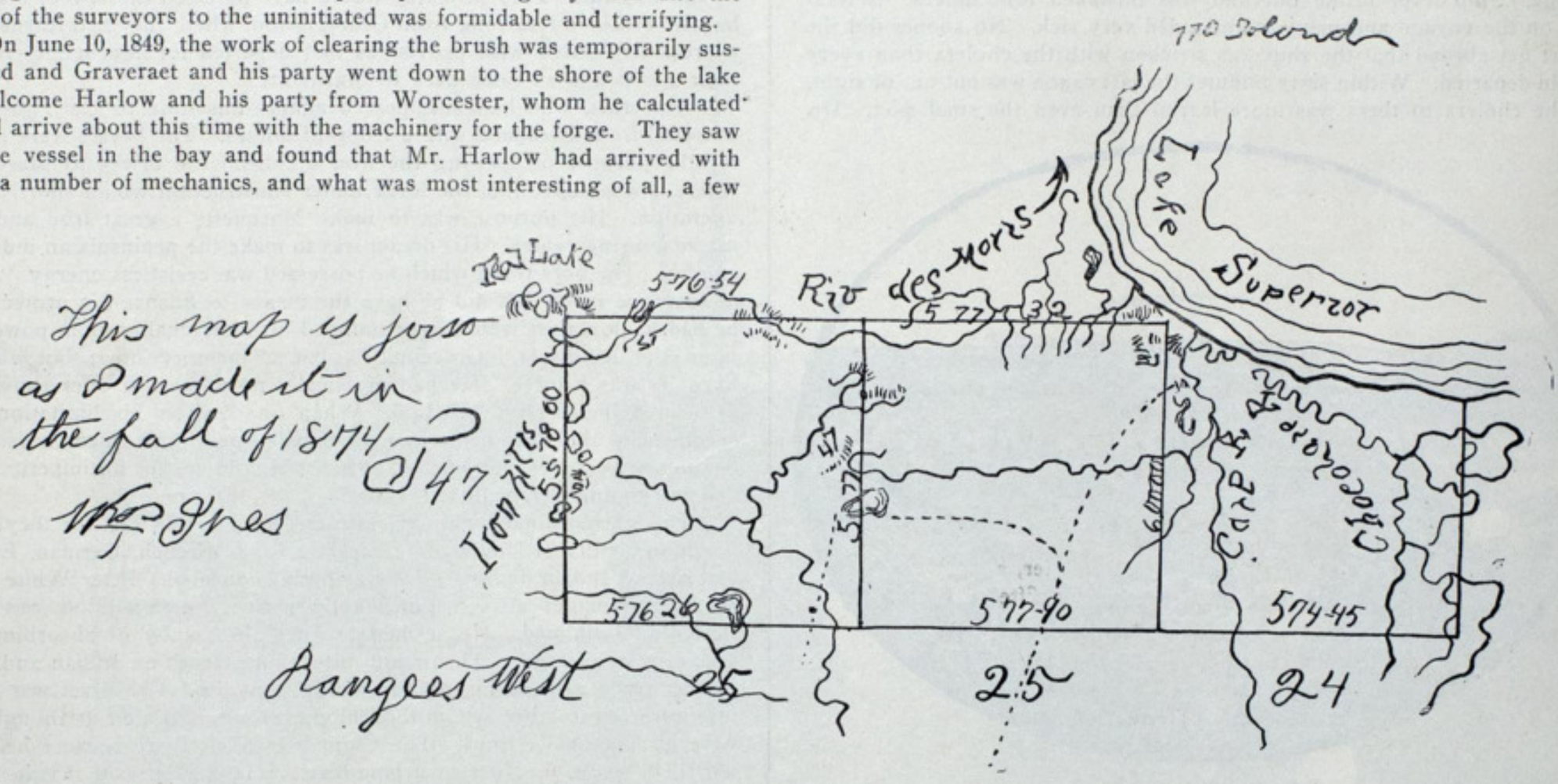
"Come and help me dig some potatoes," repeated Moody, and seizing a hoe and an old tin pail he led the way to the top of the iron mountain adjoining. About half an acre upon its pinnacle had been partially cleared and planted to potatoes. The astonished Peter saw him open one or two hills and fill his pail with large and splendid potatoes.

"I may as well get some parsnips and carrots for dinner while I'm about it," said Moody, and suiting the action to the word, he began to pull them up in great abundance before the eyes of the speechless Peter.

This was the ordinary method adopted by pre-emptors to keep their vegetables sound and sweet over winter and not, as Peter thought for the nonce, the extraordinary perversity of nature.

Graveraet set Peter to work clearing brush and kept him at it for a month. Thus he denuded the ore of its covering and prepared the way for those immense shipments which have since swung the pendulum of the world's manufacture of iron and steel west of the Alleghenies. It is needless to say that Peter could not foresee the result of his handiwork. He did not know that he was making history. He cleared brush energetically, and incidentally fought black flies by day and mosquitos by night. The activity of these pests is so incessant that the surveyors in the Lake Superior region were forced to wear buckskin masks over their faces while running the lines. As the masks speedily became grimy with dirt the sight of the surveyors to the uninitiated was formidable and terrifying.

On June 10, 1849, the work of clearing the brush was temporarily suspended and Graveraet and his party went down to the shore of the lake to welcome Harlow and his party from Worcester, whom he calculated would arrive about this time with the machinery for the forge. They saw a little vessel in the bay and found that Mr. Harlow had arrived with quite a number of mechanics, and what was most interesting of all, a few



THE FIRST MAP OF THE IRON BEARING COUNTRY—DRAWN BY WILLIAM IVES.

of the gentler sex. Every one was excited and buoyant and the impulse to give rein to the imagination was irresistible. All were seized by the same thought—the founding of a great city.

"Let me fell the first tree," cried Peter, giving voice to the common thought.

He cut a tree at the point of rock on what is now Lake street at such an angle that it fell over the bank onto the lake shore. It was a young tree that Peter selected, but it was the first. Instantly all grasped axes and attacked the virgin forest. They decided to call the future city Worcester, in honor of Mr. Harlow's native home. With the trees that were felled they began the construction of a dock that very afternoon, because they expected the arrival of another vessel with more machinery in a few days. The trees were carried into the water whole and piled lengthwise and crosswise until the structure, thus created, was even with the surface of the water. Then they wheeled sand and gravel upon it and by the end of the second week the dock seemed both capacious and substantial. Its outer front was made of solid rock. The surface was corduroyed on the third week and it was then ready for the reception of freight. One morning of the fourth week Peter White, who was always the first out of bed, was surprised to find that the dock had entirely disappeared. Not a trace of it remained. The sand of the beach was as clean, smooth and packed as it had been for centuries before. Peter could scarcely credit his senses, but in a moment the humor of the thing caught him and he merrily traced upon the sand:

"This is the spot where Capt. Moody built his dock."

Moody was wroth when he saw the havoc which the sea had made, and more wroth yet when he saw what Peter White had written. He obliterated the record and threatened to discharge the boy at the end of the month; but, as is the manner of impetuous and violent-tempered men, straightway forgot about it. It was a long time though before anyone had the hardihood to attempt the building of a dock again.

Methods were primitive indeed. Boilers were plugged and thrown overboard and the other machinery was landed into the Mackinaw barge. Cattle and horses were invariably pitched overboard to swim ashore. Passengers and perishable freight were landed with small boats. Under the leadership of James Kelly, the head carpenter, who was from Boston, Peter assisted in building a log house for his particular party, and when it was finished it was called the Revere house, after the most fashionable hotel in Boston. This building stood and retained its name as late as 1860.

During the first week or so all labor was strictly manual. There was no horse to be had. No matter how heavy a log might be the men pulled and hauled it about as best they could. By some means, however, a horse that belonged to Silas Smith came into the possession of the party and Peter was selected to drive him. The boy was immensely pleased with this task. The horse was a useful animal and catholic in its appetite. It would eat anything. Smith even warranted him to thrive on sawdust, provided it was from hardwood. A week or two later an old man named Ganson wandered into camp with a team of oxen, a cow and a calf.

"Peter, can you drive oxen?" sang out some one.

"I can," answered Peter bravely, but with some hesitation.

Peter did not know whether he could drive oxen or not. He knew that "Haw" meant for the oxen to go one way and "Gee" the other, but he did not know which was which. He reasoned, however, that if he did not know the oxen did, and taking the gad he drove them straight ahead until well out of sight of the camp, when he yelled "Whoa!" The oxen stopped.

"Haw!" cried Peter.

The oxen turned to the left. Then Peter knew that "Gee" meant to the right. When he returned to camp and nonchalantly yelled "Haw" everyone concluded that Peter had been driving oxen all his life.

"Can you milk?" asked Mrs. Wheelock, the boarding-house keeper.

"Yes," answered Peter unhesitatingly, for this he knew he could do.

And so he was let into the graces of a very good and kind woman who volunteered to do his washing and mending and who invited him to eat at the second table, for all of which, indeed, he was truly grateful.

Peter was proudly driving his oxen a week later when a stranger overtook him and demanded the cattle, claiming that they belonged to the Jackson Iron Co. Peter declined to surrender them and drove them back into camp. That night the cow and calf were stolen and it was reported on reliable authority that the directors and president of the Jackson Iron Co., who had just arrived at their mine, had had veal for dinner. More in sorrow than in anger, the Jackson company rebuked old Ganson for having sold the animals while he was in debt to the company for the freight on them up. The old man's heroic reply was that the Jackson company owed everybody, but that he chose to reverse the order of things and owe the Jackson company. In that event, he said, there was a possibility that the debt might some day be paid.

About this time Jim Presque Isle, whose real name was James Hilliard, informed Capt. Moody that there was a large meadow a short distance from Presque Isle covered with superb grass. The only trouble

with it was that the water on it was too deep to admit of mowing it. In a few hours, however, he thought a drain could be cut out into the lake that would draw the meadow dry. Moody collected his men, and, armed with shovels, axes, scythes, rakes and pitchforks, they rowed to the meadow. Capt. Moody was palpably nervous. He had never attempted to drain a field before, but he deliberately staked out the proper place for the canal and ordered the workmen to proceed. They dug each way from the center for four or five hours and then opened both ends simultaneously, when to the great astonishment of the workmen and the no less great chagrin of Moody the waters of Lake Superior rushed in and submerged the meadow. The field of scientific engineering was permanently abandoned by Moody and he directed his workmen to resume the clearing of the land at Worcester for the erection of the forge, the machine shop, the saw mill and the coal house, which were to be, in his judgment and that of the entire party, the forerunner of a great industrial city. It should be noted that the name of Worcester did not long continue. It was changed to that of the most illustrious of the Jesuit missionaries, Pere Marquette, who now sleeps peacefully at St. Ignace.

Meanwhile the restless Graveraet had gone to Milwaukee and returned in August on the little schooner Fur Trader, with a large number of Germans, some Irish and a few French, to develop the iron mines. It was the great cholera year and various parts of the country were infested with the dread pestilence. The little schooner had a frightful voyage. Ship fever broke out and was mistaken for cholera. Several died on the voyage and many were landed very sick. No sooner did the report get abroad that the ship was stricken with the cholera than every Indian departed. Within sixty minutes the last canoe was out out of sight, for the cholera to them was more fearful than even the small-pox. Dr.

MARQUETTE IN 1853.
From an old daguerreotype in the possession of Peter White.

Rogers was called upon to lay aside the axe and resume the calling which, at a later date, he practiced with such distinction at Chicago. He quickly saw that the men were not suffering with cholera at all, but with ship and typhoid fever. A rude building was constructed and used as a hospital. In a few days Dr. Rogers himself was stricken with the disease, as, indeed, were a dozen other powerful men, and the condition of all of them was desperate.

"Peter," said Graveraet quietly, "you will have to take your turn in the hospital."

"Very well, sir," said Peter as quietly.

Mrs. Wheelock advised Peter to bathe the patients constantly. Whether it was from knowledge or intuition or what not she directed him to do that which the highest medical skill at a later day pronounced the best treatment for those suffering with typhoid. Peter bathed them in cold water incessantly. Dr. Rogers, who was the weakest and worst of all, endeavored from time to time to gather his scattered faculties and direct the treatment of himself and others. He mumbled medical terms which Peter could not understand, so he went on heriocally plunging them into cold water. Things looked hopeless for two weeks; the men were seized with the haunting deliriums which accompany this terrible fever; they shrieked for food and medicine; but for answer the boy gave them a cold bath. At the end of the second week Dr. Rogers looked at him calmly and lucidly. The fever had fled and the light of reason was in his eye.

"Peter," said he, "you have saved us all, but if you could have understood me you would probably have killed us all."

It was a happy crowd when the fever was banished and the Indians cautiously put the noses of their canoes against the beach in Iron bay again.

Peter's next job was filling the first steam boiler ever set up in the peninsula. It was likewise his first contract, and as is customary in such cases, he bid too low. Peter's bid was $1.50, and as the work had to be done by hand, it took him three days and two nights to do it. When it was finished he surveyed it with sadness but with wisdom. As part compensation, however, he was installed as fireman and engineer and only left this place to enter the machine shop to become a mechanic.

The number of vessels on Lake Superior in those days was limited and they were frequently out of repair. The list embraced the propellers Independence and Napoleon and the schooners Swallow, Siscowit, Fur Trader and Algonquin. The Fur Trader was the only one which endeavored to make regular trips to Marquette, but even these were three or four weeks apart. Towards the end of October she had not put in an appearance for over ten weeks. One of the hardships of existence in the peninsula was the inability to replenish the stock of provisions regularly, owing to the infrequency of communication. The stock of provisions ran quite low. Butter and other luxuries entirely disappeared. Only a few barrels of pork and flour remained and a short-ration order had to be issued. One of the men pretended to discover a conspiracy among the Germans to seize the warehouse and he volunteered to organize a guard to protect it. The prospect of a long winter on a few mouthfuls of food per day did not appeal to the Germans whom Graveraet had brought from Milwaukee, and one bleak morning in November they started out of the country by way of Grand island and Munising. But few of the party, however, ever reached Grand island. It was a trackless wilderness and many of them stumbled by the wayside. They probably would have perished there, too, but their hardier brothers returning from Grand island, where they had learned that a propeller loaded with provisions had departed for Marquette, revived their spirits and all came back to Marquette.

Graveraet, who had disappeared again—this time to Chicago—came overland from Escanaba with a troop of horses. The horses were needed for the purpose of drawing the iron ore from the mines to Marquette, where it was hoped that the forge under construction would shortly be in operation. His purpose was to make Marquette a great iron and steel manufacturing center. His dream was to make the peninsula an industrial empire. The only thing which he possessed was resistless energy. Never at any time in his life did he have the means to finance his projects. If he had he doubtless would have stamped his individuality more powerfully upon the peninsula. Graveraet is but a memory now; but while he lived he was a force. He had practically no money to offer those who associated themselves with him. When one realizes his limitations, the spectacle of the man penetrating the wilderness with men, horses and equipment becomes magnificent. It speaks volumes for an imperious will and fascinating personality.

This extraordinary man was attracted to Peter White, for they had a common facility of language. Graveraet spoke French, German, English and several Indian dialects. He was highly educated. Peter White spoke several languages also, a gift wholly native, for his mind was practically undisciplined. He seemed to have the faculty of absorbing language by association. Throw him into contact with an Indian and Peter White would acquire his tongue within a month. Graveraet was therefore attracted to a boy whom the Chippewas followed after as though they were his personal retinue. The Chippewas liked Peter because he could tell them stories in their own language. It was even said that he had a greater hold upon the Indians than Graveraet, who had a little Indian blood himself. Therefore when Graveraet wanted anything done he summoned Peter. One day he sent him upon a mission of some delicacy to Escanaba. This meant a trip overland across the peninsula—a mere nothing nowadays, but a considerable undertaking through a continuous forest for a boy of eighteen. Two Chippewas, Mongoose and Jimmeca, volunteered to accompany Peter. This is one of the chief recollections of the man's life, which is not surprising since it was the first trip he ever undertook through the wilderness on foot. They carried their provisions upon their backs. The Indians were of incalculable aid to Peter in following the trail. When one tree is blazed the Indian seems to know by instinct where to look for the next blaze and so the trail was followed with reasonable accuracy. There is nothing more monotonous, however, than following a trail, either on horseback or on foot. On the fourth day Peter began to despair. The woods seemed endless. He thought of the children of Israel in the wilderness. They were in it for forty years; Peter was in it for four days. Poor children of Israel, thought Peter. On the seventh day he came to Escanaba, then known as Flat Rock, having scrambled through thickets and floundered through swamps. He returned in five days and made a mighty resolve never to go into the woods again. It will be shown, however, how quickly this resolution was broken.

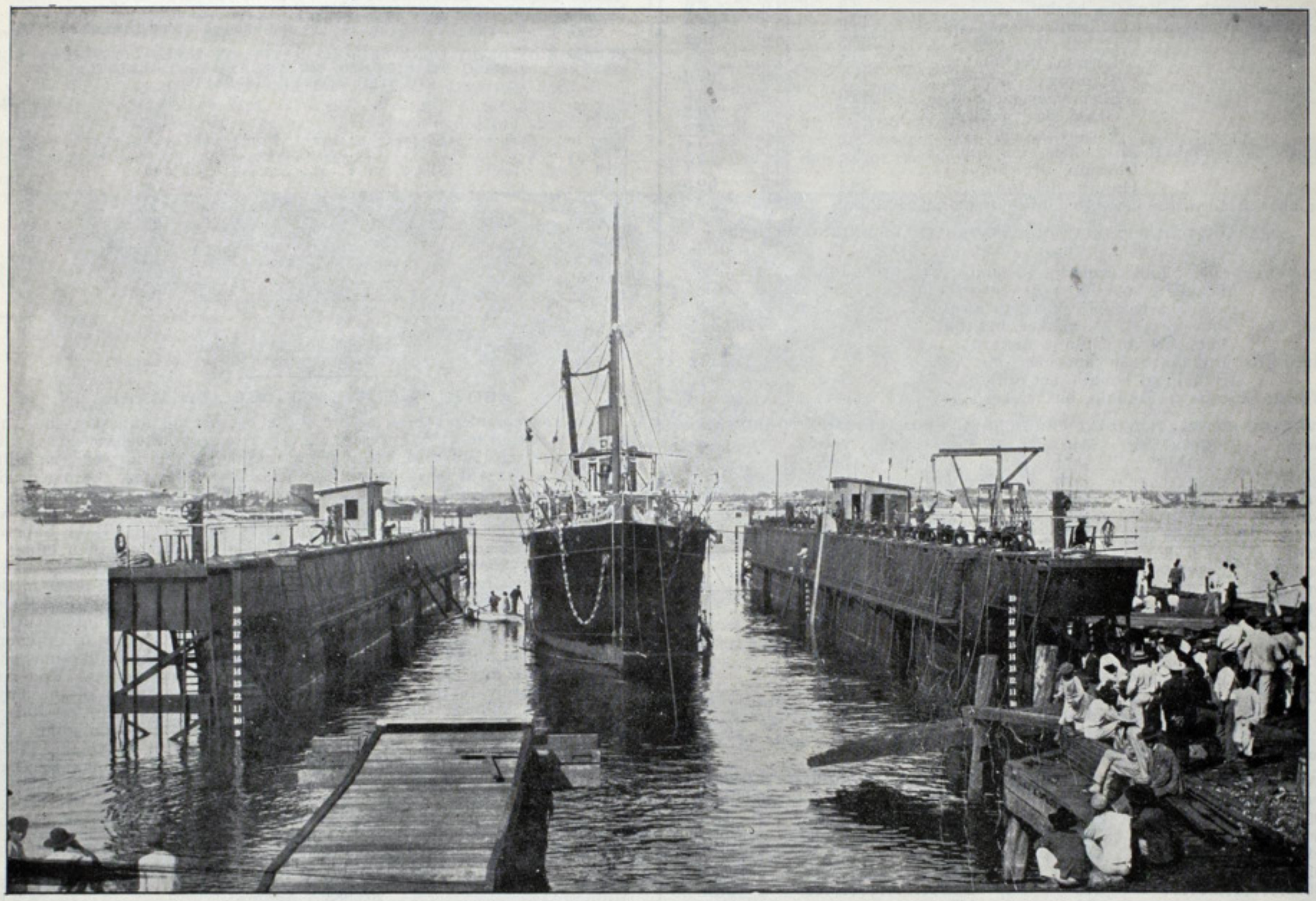
(To be continued.)

The Fore River Ship & Engine Co., Quincy, Mass., will enter the manufacture of gun forgings. The ordnance bureau of the navy department has awarded to the company a contract for sixty sets of nickel steel forgings for 3-in. rapid-fire field guns and fifteen sets of steel forgings for 4-in. 40-caliber rapid-fire guns. Work will be begun at once as the company must begin delivery in fifty days and complete it in 150 days.

A chart of Ashtabula harbor in colors has just been issued by the engineer officers in charge of the lake survey and may be had from the Marine Review.

THE HAVANA DRY DOCK CO.'S NEW DOCK.

The Havana Dry Dock Co., Havana, Cuba, has just forwarded to the Review a photograph of its new dry dock, docking its first vessel. This dry dock was recently completed and is of 5,600 tons capacity. It is operated in conjunction with the Havana Iron Works. This dry dock was recently described in these columns but its general features are: Length of main box, 280 ft.; width of main box, 88 ft. 2 in.; length of each outrigger outside of main box, 40 ft.; total length of dock at keel track, 360 ft.; height of main box at center, 11 ft. 4 in.; height of main box at sides, 10 ft. 1 in.; height from bottom to top of keel track, 11 ft. 10 in.; height from bottom to top of keel blocks, 14 ft.; height from bottom to top of air boxes or wings, 36 ft. 11 in.; width between wings at top, 70 ft. The dock contains eighteen compartments, each provided with a flood gate. It is built of steel and is finely constructed throughout. An unusual feature is its electric lighting equipment which permits its operation as well by night as by day.



THE NEW DRY DOCK OF THE HAVANA DRY DOCK CO., DOCKING ITS FIRST SHIP.

SHIP BUILDING IN PHILADELPHIA AND VICINITY.

Philadelphia, Dec. 11.—The New York Ship Building Co. at Camden, N. J., is actively engaged in preparations for the launch of the big steamship Nevadan, the first of a trio of uniform size, destined for the American-Hawaiian Steamship Co.'s Pacific trade. The three sister ships are each 371 ft. long, 46 ft. beam and 34 ft. deep. Each will have a registered tonnage of about 4,500 tons, and a carrying capacity of 5,300 tons. When completed the Nevadan, Nebraskan and Texan will ply between New York and the Hawaiian islands, via San Francisco. These craft are to burn liquid fuel and ship builders in this vicinity are awaiting the result of their performance with much interest. It is understood that on the trial trip of the Nevadan she will depend upon petroleum for fuel. Each vessel is equipped with special furnaces for burning oil. They will, however, be so constructed that the fuel can be readily changed from oil to coal without stopping the machinery.

The lake-built steamship Northwestern, which arrived in port several days ago with a cargo of iron ore from Wabana, will be converted into a tank vessel and placed in the fuel oil trade between Sabine Pass and Philadelphia and other northern ports. The vessel is one of the four which left the lakes to ply in the coastwise trade. One other of the fleet will also be changed into a suitable carrier for the new oil trade. The two remaining vessels will engage in carrying coal coastwise south and returning with lumber. The syndicate which is actively engaged in the search for vessels for the Texas Oil Co. is expected to soon make overtures for the purchase of these latter craft.

Soon after New Year's day the Cramps will launch the big steamship Kroonland, which for the last two years has been building for the International Navigation Co. The Kroonland is a sister ship to the Finland and is the largest passenger and freight steamship ever built in this country. She is 560 ft. long and 60 ft. wide. The launch of the Finland will follow about Feb. 1. There is a possibility that one or both of these vessels may run to Philadelphia. Heretofore the employment of such deep draught as they represent was impractical, owing to the treacherous ship channel to the sea. The rapid progress made by the contractors, however, who are dredging the new 30-ft. channel, warrants the belief that their labors will be largely completed by the time the Finland and Kroonland are ready for sea. The abolition of the famous Dan Baker shoal near the head of the Delaware bay marks the first step in the formation of a channel capable of affording passage for the largest ocean-going craft from Philadelphia to the sea. The beginning of the work dates from the river and harbor act, passed by congress on March 3, 1899, appropriating $300,000. The Virginia Dredging Co., which has had for more than a year past four dredges working on the shoal under government contract, has withdrawn two of their machines and announces that tomorrow, Dec. 12, they will withdraw the remaining two.

The Swedish steamship Drottning Sophia, from Wabana, N. F., is discharging at the Port Richmond wharves the largest cargo of iron ore ever brought to Philadelphia. It comprises 7,000 tons and five full days will be required to unload it. The Drottning Sophia, which is under command of Capt. H. E. Nordane, is a new vessel, having been launched this year at Kiel, Germany. Her dimensions are: Length, 407 ft.; breadth of beam, 52 ft.; depth of hold, 23 ft. She hails from Stockholm.

Coal freights by water to ports in the New England states show a decided improvement, particularly to Boston, to which port $1.30 per ton is being paid. The advance of 60 cents per ton over the rate paid a month ago leads a number of vessel owners to anticipate a return of such conditions as prevailed in 1898-99, when freight rates on coal went up to $2.25 per ton with demurrage.

The Pusey & Jones Co. of Wilmington, Del., has contracted to build a stern-wheel steamer for Cindad, Bolivar, to be used on the Orinoco river and its tributaries.

During the last month seventy-three steamships, fifteen sailing vessels and two barges, with a total of 158,103 net tons, were entered at the custom house from foreign ports, and 135 steamships, sixty-eight sailing vessels and 163 barges, with a total of 288,146 tons, from coastwise ports. During the same period eighty-eight steamships and eighteen sailing vessels, with a total of 178,313 net tons, cleared at the custom house for foreign ports, and 163 steamships, eighty-six sailing vessels and 163 barges, with a net tonnage of 303,110 cleared for coastwise ports, making a total of entrances and clearances for November of 427 steamships, 198 sailing vessels and 330 barges, the net tonnage aggregating 927,672.

The Erie basin, New York, will soon have another large sectional dry dock in commission. It is being built by the firm of Theodore A. Crane's Sons. When completed it will be 300 ft. long, 90 ft. wide and will have a lifting capacity of 4,000 tons. This new dry dock will make the ninth in operation in the Erie basin.

Advices from Paris state that the board of administration of the Suez canal has decided to admit from Jan. 1, 1902, ships drawing 26 ft. 3 in., instead of 25 ft. 7 in., the maximum allowed heretofore.

AVERAGE LAKE FREIGHTS.

In the following tables will be found average lake freights for the season just closed and for a great number of years past. It will be noted that these averages relate to rates prevailing from day to day, a record of which is kept in the office of the Marine Review. They are not tonnage averages. The Review hopes to publish, a little later on, the average rate at which all iron ore, wild and contract, was moved from the head of Lake Superior in 1901, comparing the same with similar averages for several years past.

AVERAGE DAILY RATES OF FREIGHT ON THE GREAT LAKES.

	1901 Cents.	1900 Cents.	1899 Cents.
Iron Ore, Escanaba to Ohio ports	63.9	69.5	94.8
" head of Lake Superior to Ohio ports gross ton	89.3	84.5	129.5
" Marquette to Ohio ports, gross ton	78.7	78.3	108.5
Corn, Chicago to Buffalo, bushel	1.4	1.8	2.7
Wheat, Duluth to Buffalo, bushel	2.3	2.0	3.6
Soft Coal, Ohio ports to Milwaukee, net ton	48.9	45.4	68.9
" " Duluth, net ton	38.3	40.2	45.4
" " Portage, net ton	39.5	41.3	56.4
" " Manitowoc, net ton	48.1	43.6	67.0
" " Sheboygan, net ton	45.3	43.6	66.5
" " Green Bay, net ton	48.7	45.0	66.5
" " Escanaba, net ton	46.	40.0	58.2
Hard Coal, Buffalo to Milwaukee, net ton	50.2	48.5	72.7
" " Chicago, net ton	50.2	48.5	72.7
" " Duluth, net ton	38.4	39.5	49.5
Lumber, head of the lakes to Ohio ports	266.0	233.7	....

AVERAGE DAILY FREIGHT RATES, TEN YEARS ENDING WITH 1901.

	Cents.
Iron Ore, head of Lake Superior to Ohio parts, gross ton	88
" Marquette to Ohio ports, gross ton	76½
" Escanaba to Ohio ports, gross ton	62½
Soft Coal, Ohio ports to Milwaukee, net ton	46
" Ohio ports to Duluth, net ton	35½
Hard Coal, Buffalo to Chicago, net ton	47½
" Buffalo to Duluth, net ton	32
Wheat, Chicago to Buffalo, bushel	1.78

AVERAGE RATES ON WHEAT PER BUSHEL FROM CHICAGO TO BUFFALO.

Year.	Cents.	Year.	Cents.	Year.	Cents.
1860	9.89	1874	4.03	1888	2.56
1861	11.53	1875	3.42	1889	2.51
1862	10.49	1876	2.90	1890	1.96
1863	7.51	1877	3.72	1891	2.38
1864	9.58	1878	3.07	1892	2.19
1865	9.78	1879	4.74	1893	1.66
1866	12.34	1880	5.76	1894	1.27
1867	6.67	1881	3.44	1895	1.97
1868	7.14	1882	2.50	1896	1.70
1869	6.81	1883	3.41	1897	1.56
1870	5.88	1884	2.18	1898	1.53
1871	7.62	1885	2.02	1899	2.71
1872	11.46	1886	3.68	1900	1.79
1873	7.62	1887	4.13	1901	1.42

Average, 42 years, $4.74.

Charges to vessels for shoveling, trimming and tallying weights of grain amounted to $4.15 per 1,000 bushels in 1901.

RANGE OF LAKE FREIGHT RATES ON WHEAT FROM DULUTH TO BUFFALO.

Year.	Rate, cents.	Year.	Rate, cents.
1901	2.3	1893	1¼ @ 3½
1900	2.0	1892	2¼ @ 4
1899	3.6	1891	1¾ @ 9½
1898	1.8	1890	2 @ 5
1897	1.75	1889	2 @ 5
1896	2.12	1888	2 @ 5
1895	3.50	1887	2 @ 8
1894	1¼ @ 3	1886	3¼ @ 8

Figures for seven years past represent average of daily rates for full season; previous to 1895 the rates are highest and lowest in the different seasons.

AVERAGE FREIGHT RATES ON IRON ORE PER GROSS TON, FROM PORTS NAMED TO OHIO PORTS—TABLE COVERING WILD AND CONTRACT RATES FOR TWENTY YEARS PAST.

	Escanaba.		Marquette.		Ashland and other ports at the head of Lake Superior.	
Year.	Wild or daily rate.	Contract rate.	Wild or daily rate.	Contract rate.	Wild or daily rate.	Contract rate.
1882	$1.04	$1.40	$1.26	$1.75	.....	.....
1883	1.22	1.00	1.40	1.20	.....	.....
1884	.87	1.10	1.08	1.35	.....	.....
1885	.78	.90	.98	1.05	1.25	1.15
1886	1.28	1.05	1.51	1.20	1.78	1.20
1887	1.59	1.40	1.87	1.63	2.23	2.00
1888	1.05	.90	1.30	1.15	1.43	1.25
1889	1.01	1.00	1.19	1.10	1.34	1.25
1890	.89	1.10	1.07	1.25	1.17	1.35
1891	.84	.65	1.02	.90	1.11	1.00
1892	.74	1.00	.98	1.15	1.15	1.25
1893	.56	.85	.71	1.00	.77	1.00
1894	.47	.60	.60	.80	.78	.80
1895	.73	.55	.92	.75	1.13	.80
1896	.52	.70	.66	.95	.77	1.05
1897	.45	.45	.55	.65	.57	.70
1898	.51	.45	.60	.60	.62	.60
1899	.95	.50	1.08½	.60	1.29½	.60
1900	.69½	1.00	.78	1.10	.84½	1.25
1901	.64	.60	.79	.70	.89	.80

Charge to vessel in 1901 for trimming and unloading 22 cents a ton.

Average ore rates for the entire period of twenty years: Escanaba, contract 80½ cents, wild 84 cents; Marquette, contract $1.04, wild $1.01. Average for past ten years: Escanaba, contract 67 cents, wild 62½ cents; Marquette, contract 83 cents, wild 76½ cents; Ashland and other ports at the head of Lake Superior, contract 88½ cents, wild 88 cents.

AVERAGE OF DAILY RATES ON SOFT COAL FROM OHIO PORTS TO CHICAGO, MILWAUKEE, ESCANABA, DULUTH, GREEN BAY AND MANITOWOC.

Year.	Milwaukee, cents.	Escanaba, cents.	Duluth, cents.	Green Bay, cents.	Manitowoc, cents.
1892	58	43	43	55	49
1893	48	40	38	50	41
1894	48½	39	37½	49½	48
1895	54	39	36½	50	51
1896	33½	27	29½	32½	32
1897	28½	29½	26	30	31
1898	28	26½	23	28½	28½
1899	69	58	45½	66½	67
1900	45	40	40	45	43½
1901	49	46	38	48½	48
Av. for 10 yrs.	46	39	35½	45½	44

Chicago rate about same as Milwaukee.
Coal of all kinds shipped in net tons and handled without charge to vessel.

AVERAGE OF DAILY LAKE FREIGHT RATES ON HARD COAL FROM BUFFALO TO CHICAGO, MILWAUKEE AND DULUTH DURING TEN YEARS PAST.

Year.	Chicago, cents.	Duluth, cents.
1892	59	43
1893	49	29
1894	46	25
1895	59	24
1896	36	24
1897	29	26
1898	28	23
1899	73	49½
1900	48	39½
1901	50	38
Average for 10 years	47½	32

Rate to Milwaukee practically the same as to Chicago.
Hard coal is net tons and is handled without charge to vessels.

ABOVE THE TWENTY-MILLION MARK.

As the shipments of iron ore by lake from all mines in the Lake Superior region to Dec. 1 were a little in excess of 20,000,000 gross tons, it is now more than probable that the output for the full year, including rail shipments, will be in round numbers 20,500,000 tons, compared with 19,059,000 tons in 1900. The exact figures to Dec. 1 are 20,000,926 tons, as against 18,570,310 tons by lake in the entire season of 1900. There will be added to the output from United States mines in the Lake Superior region this season 230,000 tons shipped from the Michipicoten mines in Canada, just above the Sault. Again it is found that practically all the increase comes from mines of Minnesota, the three shipping ports in that state—Duluth, Superior and Two Harbors—having shipped 1,360,000 tons more ore than in 1900, notwithstanding a marked falling off in the output of one big Mesabi mine, the Biwabik. Reports showing shipments of the different mines have been received from two of the Minnesota roads but not from any of the roads operating in the old ranges. The conspicuous feature of the Minnesota reports is the showing of the Fayal mine, which shipped 1,656,838 tons, as compared with 1,252,504 tons in 1900. This is the greatest output ever made by a single iron mine. The Mountain Iron, another Mesabi property, is also still above the million mark. The Minnesota and Chandler mines of the Vermillion range have both fallen off from last year, while the Pioneer on the same range is credited with a larger output than the Chandler. Shipments over two of the Minnesota roads, the Duluth & Iron Range and the Duluth, Mesabi & Northern, during 1901 were as follows:

DULUTH & IRON RANGE.

Mine.	Gross tons.
Minnesota	208,283
Chandler	627,322
Pioneer	678,300
Zenith	60,037
Savoy	212,008
Auburn	427,509
Fayal	1,656,838
Genoa	332,020
Hobart	224,630
Corsica	26,838
Sparta	146,452
Malta	116,185
Roberts	42,756
Hale	30,929
Kanawha	41,300
Thompson	47,630
Union	93,110
Franklin	36,432
Total	5,008,579

DULUTH, MESABI & NORTHERN.

Mine.	Gross tons.
Adams	829,118
Duluth	150,024
Pillsbury	120,708
Sellers	34,918
Burt	118,160
Hull	302,462
Rust	174,156
Franklin	2,410
Biwabik	410,075
Mesabi Mountain Iron	5,420
Mountain Iron	1,058,160
Spruce	231,547
Total	3,437,158

At the Duluth & Iron Range docks, Two Harbors, the number of vessels loaded during the season was 1,082. The first cargo was taken out by the barge 134 on May 10 and the last cargo Dec. 2 by the steamer Pasadena. The maximum cargo, mine weight, was 7,473 tons, loaded into the schooner Manila, Aug. 23. The average cargo, mine weight, was 4,630 tons.

In the death of Col. Arthur W. Soper, president of the Pintsch Compressing Co. and of the Safety Car Heating & Lighting Co., the industrial world has lost a progressive figure. He was born at Rome, N. Y., July 16, 1838. He served with several railways, closing his active railway career as general manager of the St. Louis, Iron Mountain & Southern. His later years were devoted to various enterprises having to do with railway supplies. He was a man of great energy. Indeed his creed in life was found in the motto which was ever over his desk, "If there is no way I will make one."

MORE ORDERS PLACED WITH LAKE SHIP BUILDERS.

Orders placed a couple of days ago by Capt. John Mitchell of Cleveland with the American Ship Building Co. for two steel freight steamers of the 6,000-ton kind bring the aggregate value of new ships now under contract with the big ship building organization up to $9,105,000. These two steamers cannot be delivered until August next, so that the ship building combination is now not only provided with new work for the winter but has about all that the several yards can do throughout the summer of 1902. Capt. Mitchell and his associates have two vessels coming out in May, in addition to the two for which orders have just been placed. It is announced that one of the new vessels is for the Etna Steamship Co., a Mitchell corporation already organized, and the second one for Capt. John Mitchell and others. General dimensions of the new vessels are to be the same as the steamer H. C. Frick of the Mitchell but they will not have quite as much power as the Frick. They will be 436 ft. over all, 416 ft. keel, 50 ft. beam and 28 ft. molded depth. They will have triple expansion engines with cylinders 22, 35 and 55 in. diameter and 40 in. stroke. Each steamer will have two Scotch boilers 13 ft. 2 in. diameter and 11½ ft. long and they will be fitted with Ellis & Eaves induced draft. The boats will be built at the Lorain yard of the American Co.

L. J. Petit of Milwaukee, who has extensive salt interests at several Lake Michigan ports, is negotiating with Capt. James Davidson of West Bay City, Mich., for two wooden steamers and it is expected that a contract will be closed in a few days. The over all length of the steamers will be 200 ft. or thereabouts, beam 36 or 37 ft. and molded depth about 14 ft. The cost complete is placed by Mr. Petit at about $60,000 each, and they are to be ready for service early next season.

OBSTRUCTIONS IN NAVIGABLE CHANNELS.

THE QUESTION OF BASCULE OR VERTICALLY-MOVING BRIDGES AS AGAINST THE OLD-TIME CENTER-PIER OBSTRUCTIONS, WHICH HAVE BEEN ABANDONED IN LEADING CITIES OF THE COUNTRY, ESPECIALLY ON THE GREAT LAKES, IS BROUGHT HOME TO CONGRESS BY PLANS FOR BRIDGES OVER THE POTOMAC.

At the beginning of the twentieth century the most marked and universal development in transportation is the supreme necessity and ever-increasing importance of vessel or water transportation. In nearly all civilized countries railroad construction has been developed to meet the requirements of the present time and early future, which the railroad can supply, but the railroad systems, owing to their inherent limitations, are far from adequate to meet the necessities of all classes of transportation. Vessel transportation is and will necessarily ever continue to be the most economical means of transport, as one 10,000 or 20,000-ton vessel (we will soon have many of the latter) can carry a cargo (with slight cost of maintenance of way on rivers and channels and none whatever upon the oceans) equal to the capacity of ten or twenty of the largest train-loads. The vessel is also the most economical and in many cases the only means of reaching the foreign markets of the world. It is not confined to a limited number of comparatively short routes, as is the case with the railroad, but has a virtually limitless number of routes at its service, provided without cost by the great oceans of the world.

The rivers of the world are becoming of greater importance and value each day, as they form the connecting links by which vessels can reach

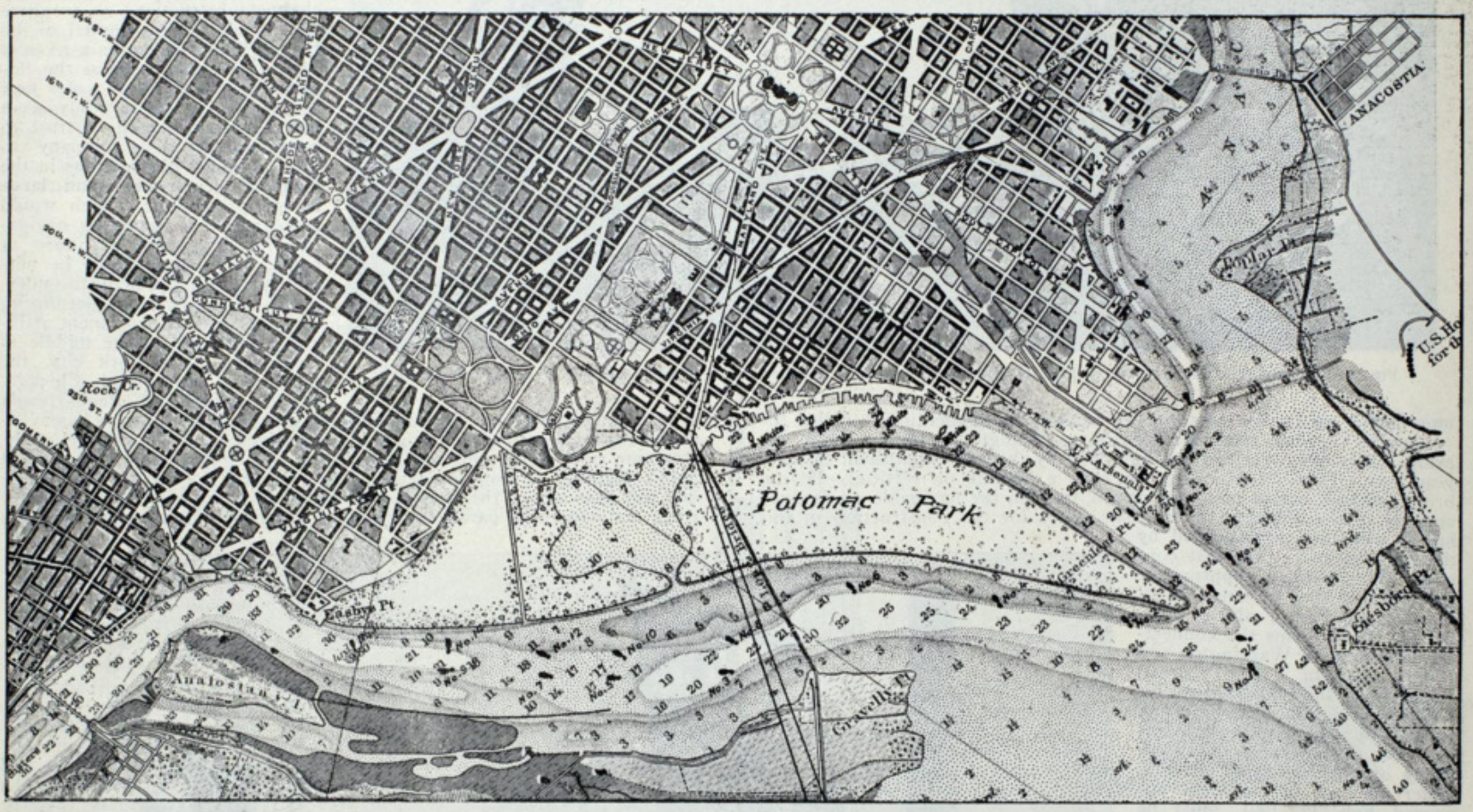


Fig. 1.—Plat showing channel of Potomac river at Washington, D. C., and approximate lines of new highway and adjacent new railroad bridge to replace old "Long" bridge; also approximate line of proposed bridge to Arlington. Buoys show dredged channel.

One of the two large side-wheel passenger steamers for the new company that is to operate between Detroit and Buffalo was launched on Saturday last at the Detroit works of the American Ship Building Co., and named Eastern States. These steamers, which are to be 366 ft. over all—larger than the City of Erie and City of Buffalo, or in fact anything in the way of a side-wheel steamer ever built on the lakes—are to make the run of 256 miles between Detroit and Buffalo in about thirteen hours. They will have immense power in inclined compound engines and will in all respects rank among the best paddle steamers in the world. A general description is reserved until such time as plans of hulls and machinery may be published.

Now it is said that Frank E. Kirby of Detroit will design the three passenger and freight steamers which are intended to replace the old wooden steamers of the Anchor line running between Buffalo and Duluth, but the Buffalo officials of the steamship company have as yet made no definite statement as to whether the vessels will be built or not. It is said that the new ships will be somewhat larger than the Northern liners North West and North Land, but will not be high power as a speed of about 15 miles an hour is all that is contemplated.

The steamer Frank W. Hart, the second of the steel freighters building for Mr. J. C. Gilchrist and others of Cleveland, will be launched at the Lorain yard of the American Ship Building Co. on Saturday next.

Leatham & Smith of Sturgeon Bay, Wis., have purchased from the underwriters the wooden steamer Elfin-Mere, recently damaged by fire, and will rebuild her.

The four Liverpool steamers, Leafield, Theano, Paliki and Monkshaven, which made their appearance in fresh water two years ago, but returned to Europe last fall, will remain on the lakes this winter. These vessels are the property of the Clergue interests at the Sault.

the commercial and industrial centers located in the interior of the various countries. These rivers must and will necessarily ever increase their importance and value with the growth of population, and are indispensable to every nation as great internal connecting public highways. It is therefore essential, not only that these rivers be improved, but that no artificial obstructions be placed in them which will impair, hamper or destroy their usefulness. This is true even though at the present time the existing commerce may not be large, as no one can predict what the demands of the early future will be for commerce or war.

When unobstructed the capacity of a river for the transportation of commerce and for service in time of war is stupendous. A river of moderate width of channel can economically and safely carry more tonnage than a ten or twenty-track railroad. In most civilized countries the principle is well recognized that *a navigable river is an extremely valuable public trust property and any impairment, alienation, misuse or misappropriation of the same is a serious violation of a public trust, even more serions in its far-reaching effects than a misuse of public trust funds.* This principle will be recognized and supported by every one in the United States as just, for the United States has been singularly favored by nature with great rivers, which have already rendered important and most invaluable service, not only in time of peace but especially in war time.

In many respects the Potomac river is one of the most important of the rivers of the United States. It is the only means of communication by water between the capital and other parts of the United States, as well as other parts of the world, and in time of war it is the most valuable artery for the defense of the capital. Owing to the fostering care of the national government, the Potomac river has already been greatly improved for navigation, so that it is now navigable for large ocean vessels as far up as the Aqueduct bridge, which is a fixed structure above George-

town. The only existing artificial obstruction below the Aqueduct bridge is the old historic "Long" bridge, which is soon to be replaced by a new bridge to carry the two tracks of the Pennsylvania railroad and another adjacent bridge for highway and electric car traffic, which will form the connecting link between Washington and Mount Vernon.

A third bridge has been proposed across the Potomac river, about a mile farther up stream than the two bridges above mentioned, called the "Memorial" bridge, from Washington to Arlington cemetery. For this bridge plans were received and approved by the war department about a year ago. These plans called for only a bascule or vertically-moving bridge without center pier obstruction, to span the navigable or dredged channel of the Potomac river. The funds for the construction of this bridge were not appropriated by the last congress. The last congress did, however, appropriate $568,000 for the construction of the highway bridge above mentioned, which forms the connecting link between Washington and Mount Vernon. The railroad bridge to be built adjacent to this highway bridge is to be built and paid for by the Baltimore & Potomac or Pennsylvania company. Plans of both of these bridges, under the act of congress approved Feb. 12, 1901, must be approved by the secretary of war. The site of the proposed bridges and the curved nature of the channel of the Potomac river at the site of these bridges is shown by the map, Fig. 1. The map also shows the narrow dredged channel marked by buoys. A representative of the railroad company submitted for approval a plan consisting of plain Pratt truss fixed spans with a center-pier swing bridge in the middle of the dredged channel to span the navigable channel. It is to be hoped in this case as in all similar cases throughout the country that permission will not be granted to this railroad company to obstruct the middle of the dredged channel of the Potomac river. If the railroad bridge is a swing bridge, the adjacent highway bridge to Mount Vernon must of necessity also be a center-pier bridge. The two swing bridges will occupy the middle and best part of the channel, and will be very obstructive to navigation. In fact, in a tidal river, like the Potomac river, such an obstruction is much more serious than a similar obstruction upon the non-tidal rivers around the Great Lakes, where such obstructions have been universally condemned and are rapidly being removed and replaced by bascule or vertically-moving bridges. This Washington matter brings home to congress the serious question of artificial obstructions in navigable channels. If only a bascule bridge was approved by the war department for the Memorial bridge to Arlington, then it would seem that there is much greater reason for adopting the bascule type of structure in the two bridges about to be built, so close together farther down stream.

Fig. 2 on the following page illustrates the difficulty of navigating a merchant or naval vessel through the narrow channels provided by two adjacent swing bridges, and Fig. 3, just under it, shows the clear unobstructed channel and the ease of navigating either the largest merchant or naval vessels through two adjacent bascule bridges. These illustrations are so graphic that further comment is unnecessary.

In New York, Boston, Philadelphia, Bridgeport (Conn.), Chicago, Milwaukee, Cleveland, Buffalo, and many other cities of the United States and foreign countries, center-pier swing bridges are being removed because they form obstructions to navigation and are being replaced by vertically-moving or bascule bridges, in order to prevent just such channel obstructions as are here spoken of. At the capital of the United States and upon a river of such great importance as the Potomac, at the beginning of a new century, it would certainly seem like a serious breach of trust to permit a railroad company to place artificial obstructions in the form of center-piers and large bridge protections, which would stand as a bar impairing navigation for fifty years or more to come. This should not be permitted. It is not difficult to understand the injustice of permitting the placing of a permanent artificial obstruction in the middle of Broadway, New York city, the middle of State street, Chicago, or the middle of Pennsylvania avenue at Washington. Yet each of these great public highways has available many adjacent parallel streets. The dredged navigable channel of the Potomac river is the only available artery and should forever be a great public highway serving navigation, more valuable both in times of peace and war than any of the streets mentioned. It is the only available water route and cannot be paralleled by other waterways giving equal facilities for navigation to and from the capital.

There is also produced herewith two photographic views—Fig. 4, showing the Chicago river obstructed by two center-pier swing bridges, and Fig. 5, showing the clear channel provided by the removal of the two swing bridges and the substitution of two bascule bridges. These illustra-

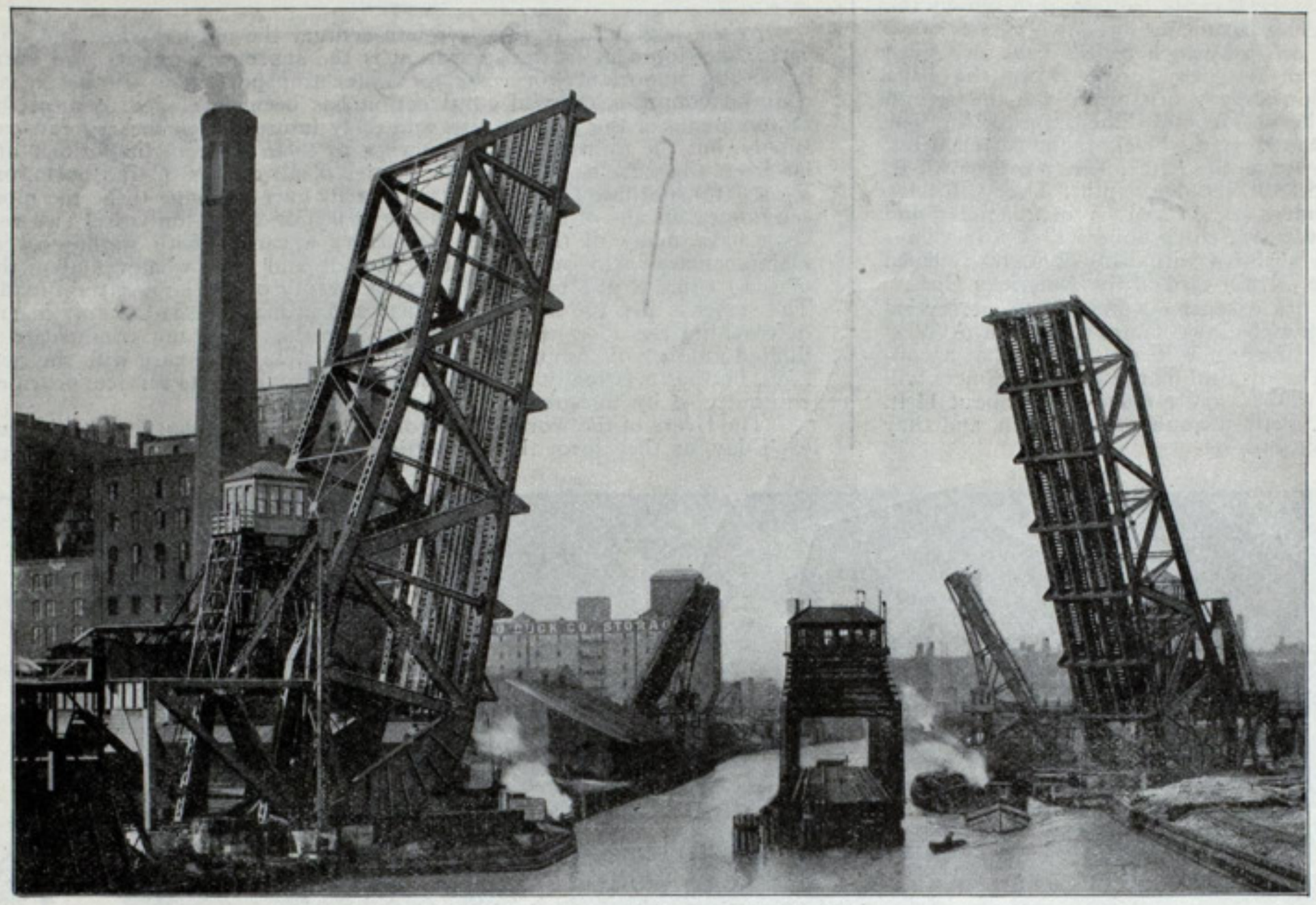


Fig. 4.—Showing the Chicago river artificially obstructed by two center-pier swing bridges, opened in center of channel.

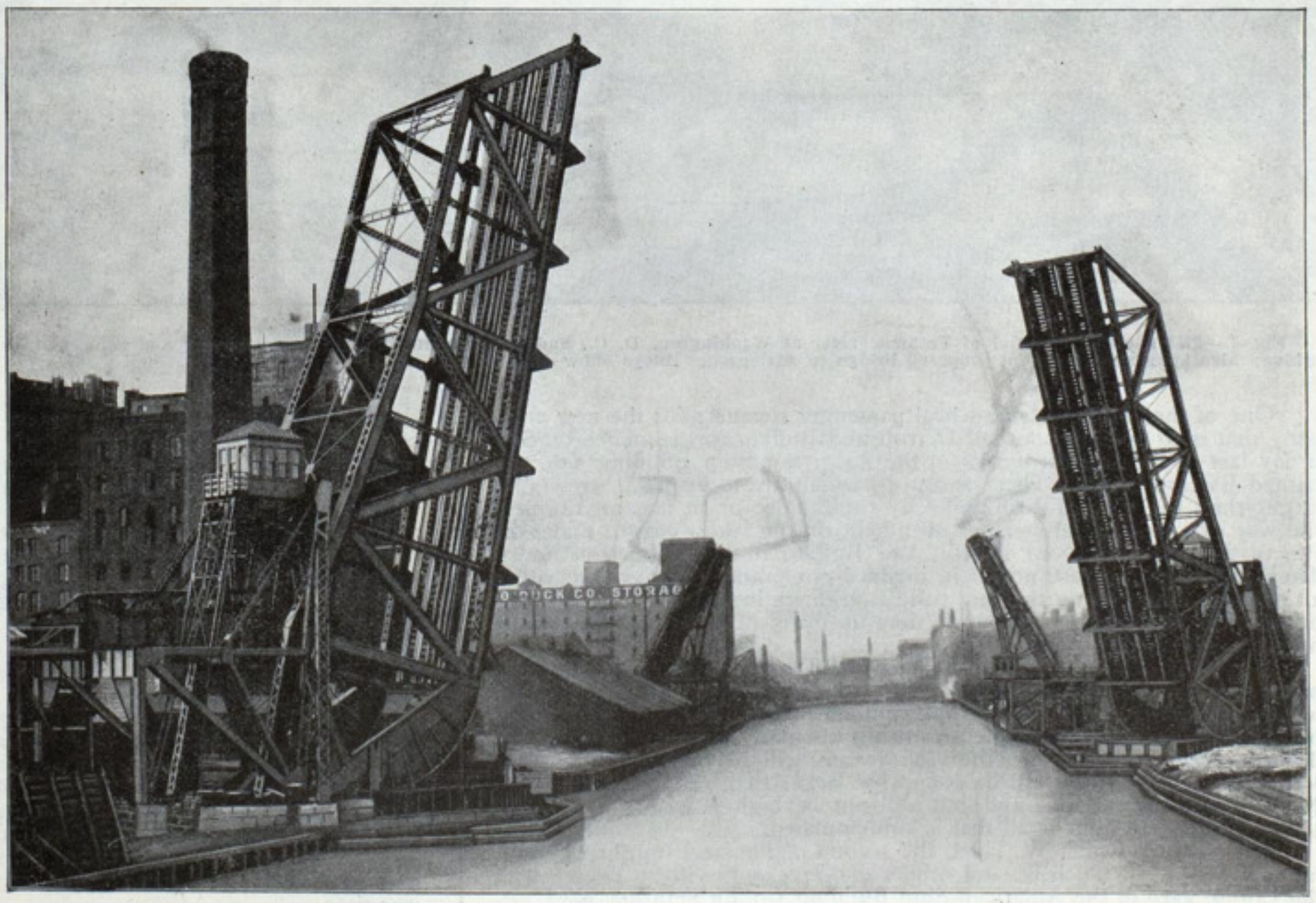


Fig. 5.—Showing the same channel in Chicago river cleared by the removal of the two center-pier swing bridges and the substitution of two bascule bridges.

tions forcibly present the question: Can any policy be more unwise and wasteful than to dredge a navigable channel in the Potomac river at great cost and at the same time formulate plans to obstruct the center and best part of this dredged channel by large swing bridges, piers and protections? Would this not clearly be a violation of a great trust?

THE QUESTION OF DELAY IN PORT.

Buffalo, Dec. 11.—Spite of the many other difficulties that beset the lake trade in these rushing business times it seems to be agreed that the most perplexing problem of them all is the constant slowing up of the ports in the matter of handling. This of course means a continuation of the lake fleet as a necessary part of the carrying trade, but unless something is done there must be smaller profits or higher freights, possibly considerable of both. Said a fleet manager to me a few days ago:

"We are going to demand at least a dollar on ore for next season. We must have it to make money out of the business. You have no idea of the way our boats are 'hung up' in port these days. I have been figuring on season's earnings lately and I have found that we have made less out of 80-cent ore this season than we did along back when we had to take 60 cents. The reason is that we have to lie in port so long. We manage to make about an even two trips a month with our tows, but just about half that time is spent in port. It is awfully expensive to do business in that way."

The fact is that the volume of the lake trade is so great that the port facilities have been left behind. Handlers say that the difficulty is not so much on account of scant stationary handling apparatus as it is storage room and cars, both of which are not only inadequate but fast becoming more so. It will be seen from this that there is no possibility of relief through all-rail service, for to carry everything all the way in cars would make them scarcer than they are. It appears to have been the Pennsylvania system that was worst handicapped the present season. Other roads were more or less blocked, but the Pennsylvania was demoralized. The spectacle of package-freight liners tying up in October for want of anywhere to unload is something very distressing. Only the Baltimore & Ohio connection at Fairport was equal to the demand for cars, and the bulk of business there was of course too small to afford much general relief.

Buffalo did much better than Erie with flour, but was not able to come up to requirement, as one railroad after another ran short of cars. This port is still at its best in the line of mere handling, though, and can take out a cargo, whether of grain or flour, as speedily as ever, and the coal is loaded with all the usual despatch. There has not been much waiting here with ore cargoes, as this port is steadily increasing its facilities in that line. It is a trifle distressing, however, to see the big grain cargoes drop inside the outer breakwater and come to anchor these later days, for want of even a stopping place inside, but that is now a minor matter, for the fleet is here to stay, anyhow.

They say that some of the car and locomotive builders could work at full capacity for two years on present orders. With every prospect of a full year in every line of business before us, and with no expectation of a strike in steel to afford other industries relief, expensive as it may be to business generally, the outlook is not reassuring. Excessive prosperity is making us lopsided. But for that strike last summer there would have been trouble much sooner than there was. This fast-growing difficulty somewhat obscures the labor question, though that is bad enough and not likely to be any better so long as the labor unions are in control. It is decidedly to the advantage of the men that there is a much more perplexing problem to deal with. The slow handling will make it necessary to increase the shore operating force very materially. Here is an instance of what an interested hustler can do in that line. A Buffalo lumber firm had two tows to load at Menominee late last month. One tow took coal up for Chicago and the other for Racine. A member of the firm followed them and didn't sleep any more than he had to till they were loaded again and on their way down. In this way they all returned inside of insurance limits. Without the extra aid they would have failed. Still hustling will not conquer impossibilities. What is to be done about it?

JOHN CHAMBERLIN.

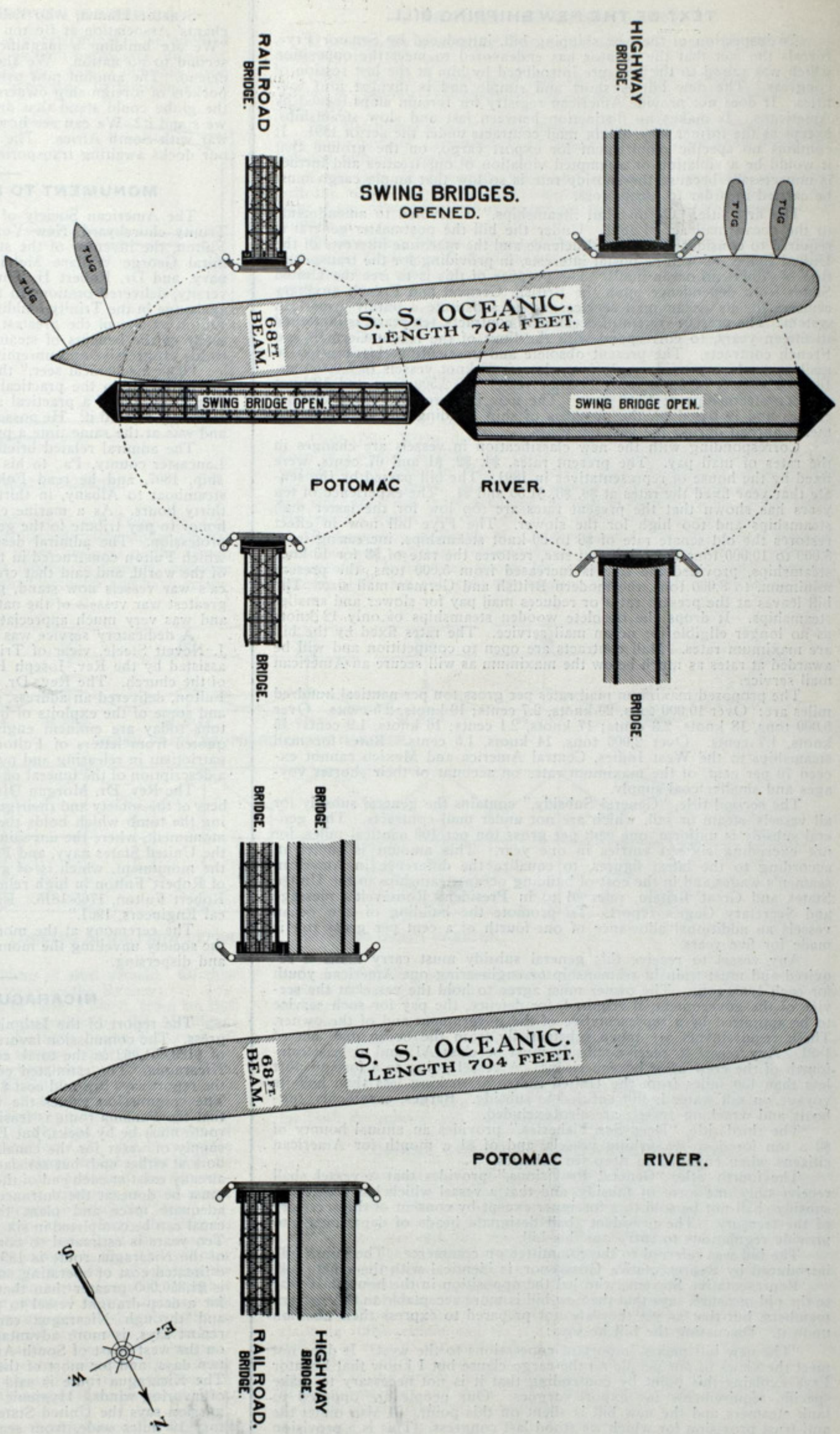


Fig. 2, upper view.—Shows how middle of dredged channel of the Potomac river would be obstructed if two adjacent center-pier swing bridges were built.

Fig. 3, lower view.—Shows clear unobstructed channel and the ease of navigating the largest merchant or naval vessels through two adjacent bascule or vertically-moving bridges.

TEXT OF THE NEW SHIPPING BILL.

An inspection of the new shipping bill, introduced by Senator Frye, reveals the fact that the senator has endeavored to meet the opposition which was raised to the measure introduced by him at the last session of congress. The new bill is short and simple and is divided into four titles. It does not provide American registry for foreign ships owned by Americans. It makes no distinction between fast and slow steamships, except as the former may obtain mail contracts under the act of 1891. It contains no specific requirement for export cargo, on the ground that it would be a violation or attempted violation of our treaties and further is unnecessary because the subsidy rate is so low that ample cargo must be carried in order to escape loss.

The first title, "Ocean Mail Steamships," is devoted to amendments to the ocean mail act of 1891. Under the bill the postmaster-general is required to consider the national defence and the maritime interests of the United States, as well as postal interests, in providing for the transportation of American ocean mails. The purpose of this is to free the United States from dependence upon the British, German and French auxiliary cruisers for its ocean mail service and to substitute a purely American system. The present system of ocean mail contracts, ten years, is increased to fifteen years, to correspond with the limit of the recent German and French contracts. The present obsolete and unscientific classification of mail steamships provides only four classes, 20-knot vessels of 8,000 tons, 16-knot vessels of 5,000 tons, 14-knot vessels of 2,500 tons and 12-knot wooden steamships of 1,500 tons. The new bill provides seven distinct classes and is based on the progress of ship building and mail requirements abroad during the past ten years.

Corresponding with the new classification in vessels are changes in the rates of mail pay. The present rates, $4, $2, $1 and 67 cents, were fixed by the house of representatives in 1891. The bill passed by the senate that year fixed the rates at $6, $3, $1.50 and $1. The experience of ten years has shown that the present rates are too low for the faster mail steamships and too high for the slower. The Frye bill now in effect restores the old senate rate of $6 to 20-knot steamships, increasing from 8,000 to 10,000 tons the minimum size, restores the rate of $3 for 16-knot steamships, provided the size is increased from 5,000 tons, the present minimum, to 8,000 tons, the modern British and German mail size. The bill leaves at the present rates or reduces mail pay for slower and smaller steamships. It drops the obsolete wooden steamships of only 12 knots as no longer eligible for ocean mail service. The rates fixed by the bill are maximum rates. Mail contracts are open to competition and will be awarded at rates as much below the maximum as will secure an American mail service.

The proposed maximum mail rates per gross ton per nautical hundred miles are: Over 10,000 tons, 20 knots, 2.7 cents; 19 knots, 2.5 cents. Over 5,000 tons, 18 knots, 2.3 cents; 17 knots, 2.1 cents; 16 knots, 1.9 cents; 15 knots, 1.7 cents. Over 2,000 tons, 14 knots, 1.5 cents. Rates for mail steamships to the West Indies, Central America and Mexico cannot exceed 70 per cent. of the maximum rates on account of their shorter voyages and smaller coal supply.

The second title, "General Subsidy," contains the general subsidy for all vessels, steam or sail, which are not under mail contracts. This general subsidy is uniform, one cent per gross ton per 100 nautical miles, for not exceeding sixteen entries in one year. This amount is sufficient, according to the latest figures, to equalize the difference in American seamen's wages and in the cost of building ocean steamships in the United States and Great Britain, referred to in President Roosevelt's message and Secretary Gage's report. To promote the building of new ocean vessels an additional allowance of one-fourth of a cent per gross ton is made for five years.

Any vessel to receive this general subsidy must carry mails if required and must train in seamanship or engineering one American youth for each 1,000 tons. The owner must agree to hold the vessel at the service of the government, if required, for defence, the pay for such service to be appraised by a representative of the government and of the owner. These requirements are taken substantially from the ocean mail act of 1891. Any vessel to receive subsidy must be class A1, and at least one-fourth of the crew must be Americans. A vessel going to a foreign port less than 150 miles from the United States or making less than half its voyage on salt water is not entitled to subsidy. Barges, canalboats, tugboats and wrecking vessels are also excluded.

The third title, "Deep-Sea Fisheries," provides an annual bounty of $2 a ton for deep-sea fishing vessels, and of $1 a month for American citizens when engaged in deep-sea fisheries.

The fourth title, "General Provisions," provides that a vessel shall receive only one form of subsidy, and that a vessel which has received a subsidy shall not be sold to a foreigner except by consent of the secretary of the treasury. The president shall designate heads of departments to provide regulations to carry out this bill.

The bill was referred to the committee on commerce. The house bill, introduced by Representative Grosvenor, is identical with the senate bill.

Representative Stevens, who led the opposition in the house last year to the old measure, says that the new bill is more acceptable to the western members, but that as yet they are not prepared to express their position upon it. Discussing the bill he says:

"The new bill makes important concessions to the west. It does not meet the views of our people on the cargo clause but I know that Senator Frye explains this point by contending that it is not necessary to make specific requirements for export cargoes. Our people are opposed to tank steamers and the new bill is silent on this point. It also omits the anti-trust provision for which we stood last congress. This is a provision against trusts in the ownership, management and building of ships. Senator Frye has, however, abandoned the speed and size clause of the old bill and substitutes a clause for the reclassification of the postal subsidy act. The bill makes no limitation of the subsidy to be paid. In the old bill the aggregate was $9,000,000 per annum. The western members last year asserted that the bill in its speed and size clause would give the bulk of the $9,000,000 to fast ships, leaving the freighters out, but this objection to the new bill is removed. It also provides that vessels must carry a certain percentage of American apprentices and seamen. Another feature of the new bill is the construction bounty which is to remain in force five years. The new bill does not meet all the objections we urged but we have received some important concessions."

Senator Hanna, who delivered an address before the Boston Merchants' Association at Boston Tuesday evening on the shipping bill, said: "We are building a magnificent navy and shall continue until we are second to no nation. We should also build something for that navy to defend. The amount now paid annually by American merchants into the pockets of foreign ship owners is $200,000,000. No country on the face of the globe could stand that drain but the United States. And why need we stand it? We can see how the subsidy is affecting England and her war with South Africa. The raw materials from our mines are lying on our docks awaiting transportation abroad."

MONUMENT TO ROBERT FULTON UNVEILED.

The American Society of Mechanical Engineers has just unveiled in Trinity churchyard, New York, a monument to the memory of Robert Fulton, the inventor of the steamboat. Prior to the unveiling Rear Admiral George Wallace Melville, engineer-in-chief of the United States navy, and Dr. Robert H. Thurston, dean of Sibley college, Cornell university, delivered orations in the salesrooms of the New York real estate exchange in the Trinity building. Rear Admiral Melville spoke of Robert Fulton as one of the greatest benefactors of the human race and recited many of the benefits of steam navigation. His success, he said, was due to his progressive and unremitting labor.

"The mechanical seer," the admiral said, "is often unable to place his invention within the practical reach of humanity. Fulton's claim to the first invention of a practical steamboat cannot be disputed, and he commercially created it. He possessed the power of invention, or creativeness, and was at the same time a practical engineer."

The admiral related briefly Fulton's career from his birth in 1765 in Lancaster county, Pa., to his success with the Clermont, the first steamship, 1807, and he read Fulton's letter describing the first trip of the steamboat to Albany, in thirty-four hours, and the return trip, made in thirty hours. As a marine engineer, the admiral said, he deemed it an honor to pay tribute to the genius of Robert Fulton, who had created the profession. The admiral described the steam propelled floating battery which Fulton constructed in the war of 1812, as the first steam war vessel of the world, and said that credit was due to him for the fact that America's war vessels now stand, gun for gun and ton for ton, equal to the greatest war vessels of the nations. Dr. Thurston's address was scholarly and was very much appreciated.

A dedicatory service was next held in Trinity church. The Rev. Dr. J. Nevett Steele, vicar of Trinity parish, conducted the ceremony, being assisted by the Rev. Joseph Hill, the precentor, and the full vested choir of the church. The Rev. Dr. Robert Fulton Crary, a grandson of Robert Fulton, delivered an address, speaking of the genealogy of Robert Fulton and some of the exploits of his ancestry. He said that a number of Fultons today are eminent engineers in various parts of the world. He quoted from letters of Fulton to show how largely he was actuated by patriotism in releasing and putting in force the power of steam. He read a description of the funeral of Robert Fulton in Trinity churchyard in 1815.

The Rev. Dr. Morgan Dix pronounced the benediction, and the members of the society and their guests then proceeded to the churchyard, passing the tomb which holds the body of Fulton, and marching to the new monument, where the unveiling took place. Ex-Chief Engineer Haswell of the United States navy, and President S. T. Wellman led the procession to the monument, which is of granite, bearing on its face a bronze portrait of Robert Fulton in high relief, with the inscription: "To the memory of Robert Fulton, 1765-1815. Erected by the American Society of Mechanical Engineers, 1901."

The ceremony at the monument was quite informal, the president of the society unveiling the monument, and those who were present filing by and dispersing.

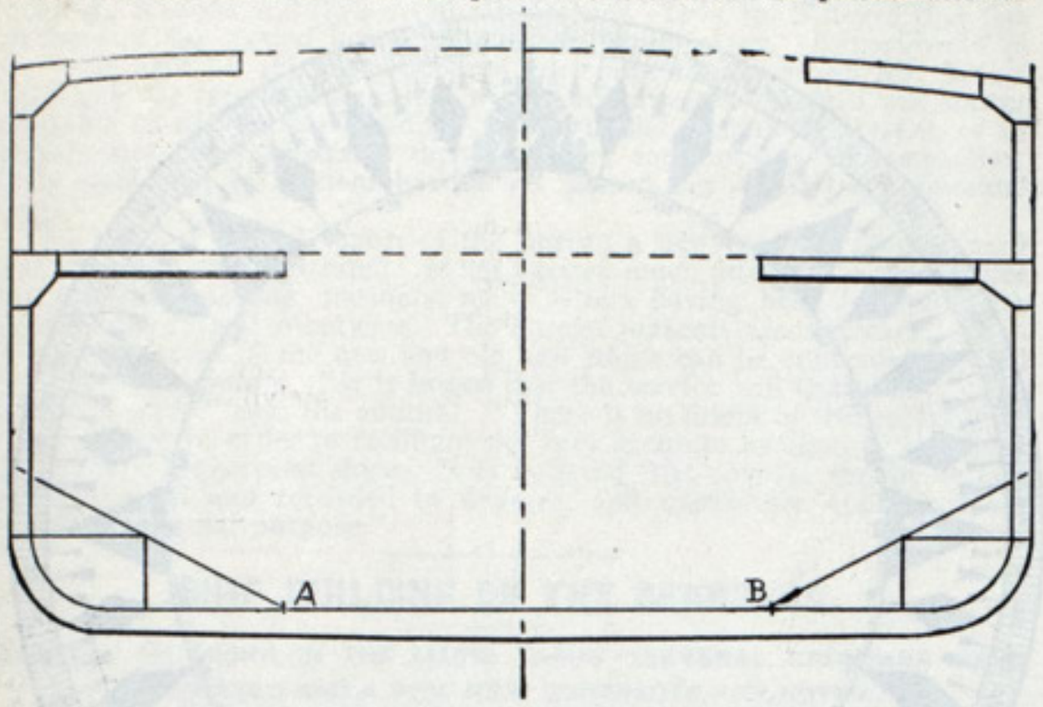
NICARAGUA ROUTE ENDOSRED.

The report of the Isthmian canal commission has been sent to congress. The commission favors the Nicaragua route and makes an estimate of $189,864,062 as the total cost of construction of the canal through Nicaragua. The estimated cost of the Panama route is $144,233,358, but the report says it would cost $109,141,000 to obtain the Panama concession. The commission values the work done at $40,000,000. The report says that the Panama route is feasible as a sea-level canal, while the Nicaragua route must be by locks, but Lake Nicaragua will furnish an inexhaustible supply of water for the canal. The Nicaragua route has no natural harbors at either end, but satisfactory harbors may be constructed. Harbors already exist at each end of the Panama canal route, but considerable work must be done at the entrance of the harbor on the Atlantic side. With adequate force and plant the commission estimates that the Nicaragua canal can be completed in six years, exclusive of two years for preparation. Ten years is estimated to complete the Panama canal. The total length of the Nicaragua route is 183.66 miles and the Panama route 49.09. The estimated cost of operating and maintaining the Nicaragua canal annually is $1,350,000 greater than that of the Panama canal. The estimated time for a deep-draught vessel to pass through the Panama canal is 12 hours, and through Nicaragua canal 33 hours. The Nicaragua route, the report says, is more advantageous for commerce save that originating on the west coast of South America. For the gulf ports the advantage is two days, and for most of the ports on the Atlantic and Pacific one day. The Nicaragua route is said to be better for sailing vessels on account of favoring winds. Hygienic conditions also favor Nicaragua. The commission says the United States should acquire control of a strip of territory 10 miles wide, from sea to sea, through which to build the canal. The consent of Nicaragua and Costa Rica must be obtained to construct the canal, but the report says this can easily be secured. The concessions granted by the Colombian government to the Panama Canal Co. have many years to run, and new concessions cannot be granted the United States.

The report concludes as follows: "After considering all the facts developed by the investigations made by the commission, the actual situation as it now stands, and having in view the terms offered by the new Panama Canal Co., this commission is of the opinion that the most practicable and feasible route for an isthmian canal, to be under the control, management and ownership of the United States, is that known as the Nicaragua route."

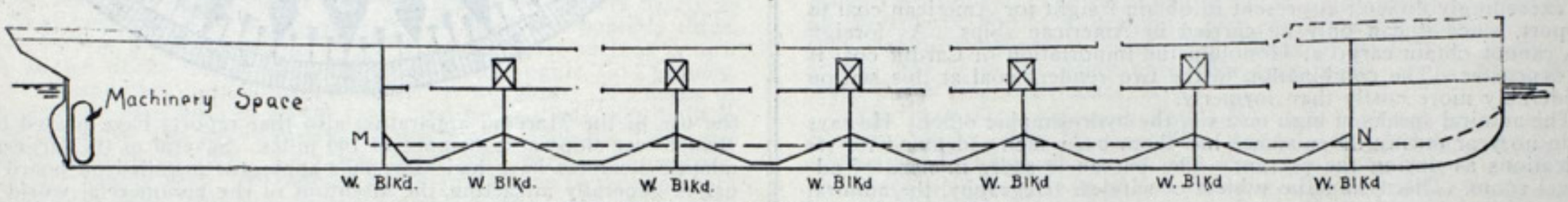
PLANS OF THE NEW COLUMBIA IRON WORKS CO.

Rough sketches showing hopper bottom construction to be adopted in a fleet of steel grain carrying steamers, to be built by Messrs. Botsford, Jenks & Duncan of Port Huron, Mich., at the new Columbia Iron Works on the St. Clair river are presented herewith. In pursuance of a

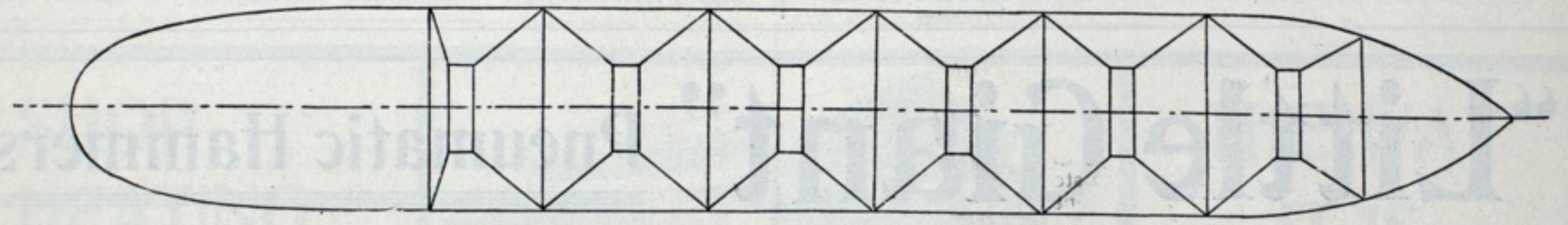


MIDSHIP SECTION, PROPOSED GRAIN CARRIER.

long-time contract, entered into recently with the Grand Trunk Ry. Co., Mr. Botsford and his associates, who are already operating under charter three steel steamers in connection with the grain business of the Grand Trunk at Port Huron, propose to build at Sarnia, in Canada, opposite Port Huron, a steel elevator of 1,500,000 bushels capacity and have organ-



SHEER PLAN, PROPOSED GRAIN CARRIER.



LOOKING DOWN FROM UPPER DECK, PROPOSED GRAIN CARRIER.

ized the Columbia Iron Works for the building of steel vessels. Of this latter project Mr. J. E. Botsford says in a letter to the Review:

"We have the deeds for about 50 acres of land, 1,700 ft. front on the St. Clair river below the Oakland house, accessible by the Michigan Central railroad and two other railroads. We have begun the work of establishing a ship yard and will have berths for two boats, one a package freight and grain boat 380 ft. long and 50 ft. beam for our line already in operation, to run between Port Huron and Duluth. The second vessel is to be a lumber carrier, 180 ft. keel and 40 ft. beam, for Cleveland parties. All stock in the ship yard company has been subscribed and paid in. The stockholders are J. E. Botsford, F. D. Jenks and C. O. Duncan of Port Huron, and W. F. Botsford of Los Angeles, Cal. We have ample means to carry the project through. The package freight boat will be built on a new design as far as the water bottom is concerned, the arrangement being such to avoid shoveling of grain, or trimming of coal where clam shells are used. We enclose you blue prints showing the idea."

The plans to which Mr. Botsford refers show quite clearly the changes proposed in the ship's bottom. It will readily be seen that the construction is more complicated and will prove more expensive than the ordinary tank-top covering. There is no doubt of the practicability of building the bottom of a vessel in this way, but there is some question as to whether the extra cost of construction and repairs in event of bottom damage will be offset by avoiding the expense of operating steam shovels, etc., in getting the grain to the elevator leg in the hold of the vessel. The new form of bottom does not, of course, add or subtract from either the capacity of the lower hold or the capacity of the water bottom.. The scheme allows the grain to trim itself into the hoppers and directly to the base of the marine leg, which is lowered in the usual manner through the hatches.

It is reported that Sir Christopher Furness announced his intention just before sailing for England of building six tank steamers at his ship yards in England, which will be put in the Gulf trade for the carrying of fuel oil from Texas. They will run regularly between Galveston and New Orleans and the United Kingdom ports, carrying the first fuel oil in quantity as fuel to Great Britain. Each will have a capacity of 8,000 tons and oil will be used as fuel on the ships themselves. It is estimated that 500 tons will serve as fuel for the round trip from Galveston to a British port. This will leave as cargo 7,500 tons. In addition to these ships the Furness line is to build a fleet of freight boats for general cargo between American and European ports. The Furness line now owns about 125 steamers, most of which are in the Atlantic trade, and Sir Christopher has expressed an intention of doubling the tonnage within the next two years.

AROUND THE GREAT LAKES.

It is officially announced that the Welland canal will be closed after Saturday, the 14th inst.

Capt. Geo. H. Lester, who was for many years connected with the Toledo & Saginaw Transportation Co., died Monday at his home in West Bay City.

Mr. Benedict Crowell, of the firm of Crowell & Peck, mining engineers and chemists, Cleveland, is in South America examining newly developed mineral deposits.

Capt. Geo. H. Vrooman, who has been for a long time associated with the Maytham tug and vessel interests at Buffalo, will succeed the late Capt. Alex. Water as local manager for the Great Lakes Towing Co. at Buffalo.

Quite a large amount of vessel capacity for winter storage at Duluth and spring delivery at Buffalo has been chartered at 3 cents. A few vessels have also been chartered to load wheat at Duluth, first trip in the spring, at 2½ cents.

Mr. Edward Gaskin, ship building expert of Buffalo, will be at the Cramp works, Philadelphia, until about the first of the year looking after repairs to the lake-built steamer Paraguay which was taken to the seaboard to engage in bulk oil trade.

A modern car dump machine to be erected on the lake front, Cleveland, for the National Fuel & Dock Co., of which John A. Donaldson is general manager, will be built by the McMyler Mnfg. Co. of Cleveland and will be ready for operation on the opening of navigation next spring.

Capt. John Kirby died at his home in Cleveland this week. He was born in London in 1825, but came to this country at an early age and settled in Cleveland in 1849. He served with the Union line as captain for thirty-three years. He retired several years ago from active service and since then had twice occupied the post of harbor master in Cleveland. He leaves a widow and one son, John Kirby, a marine engineer.

Resignations of Frank M. Osborne and C. W. Baine of Cleveland, president and secretary respectively of the Pittsburg Coal Co., were not unexpected. It has been known for some time past that these Cleveland officers of the big soft coal combination were not altogether in harmony with the Pittsburg interests connected with the management. The resignations are to take effect Jan. 1. Treasurer U. A. Andrews has also resigned.

Changes in the legal department of the United States Steel Corporation at Duluth, Minn., have been announced. J. B. Cotton, formerly attorney for the Rockefeller interests, has been appointed solicitor general of the transportation interests of the United States Steel Corporation. Billson, Congdon & Dickinson become general solicitors for the mining interests. T. B. Kellogg of St. Paul has been appointed general counsel for both the mining and transportation interests.

CHASE COMPANY'S TOWING MACHINE.

A decision just rendered by the United States circuit court of appeals in a patent case that originated in Cleveland is of considerable interest to vessel owners. The automatic steam towing machine, of late years regarded as a necessity on all tows of large vessels, was for some time made only by one concern, the American Ship Windlass Co. of Providence, R. I., under patent rights granted to Messrs. Shaw and Spiegle, who are paid royalty by the Providence company. Two or three years ago the Chase Machine Co. of Cleveland brought out a type of towing machine and several of them were installed on lake vessels. The American Ship Windlass Co. brought suit in the United States district court at Cleveland, claiming infringement and the Chase company has for some time been tied up as regards the manufacture of towing machines. The decision of the district court was in favor of the Chase company, but the case was appealed to the circuit court. Now the circuit court affirms the decision of the lower court and gives to the Chase company the right to go ahead with the manufacture of its machine.

Mr. F. H. Clergue of Sault Ste. Marie and his associates have organized the Franco-Canadian Navigation Co., Ltd., with a capital of $1,000,000 to carry on a general steamship and forwarding business. Those interested in the company besides Mr. Clergue are Messrs. Robert Mackay, A. A. Thibaudeau, G. A. Drummond, W. E. Blumhart, Henry Miles, L. E. Geoffrion of Montreal; Mr. Lyman Melvin-Jones, Toronto; E. V. Douglas, Philadelphia; J. R. Booth, Ottawa. The provisional directors are: F. H. Clergue, R. Mackay, E. V. Douglas, G. E. Drummond and L. E. Geoffrion.

A chart of Lake Erie in colors (engineer survey) has just been issued and may be had from the Marine Review.

ANNUAL REPORT OF REAR ADMIRAL BRADFORD.

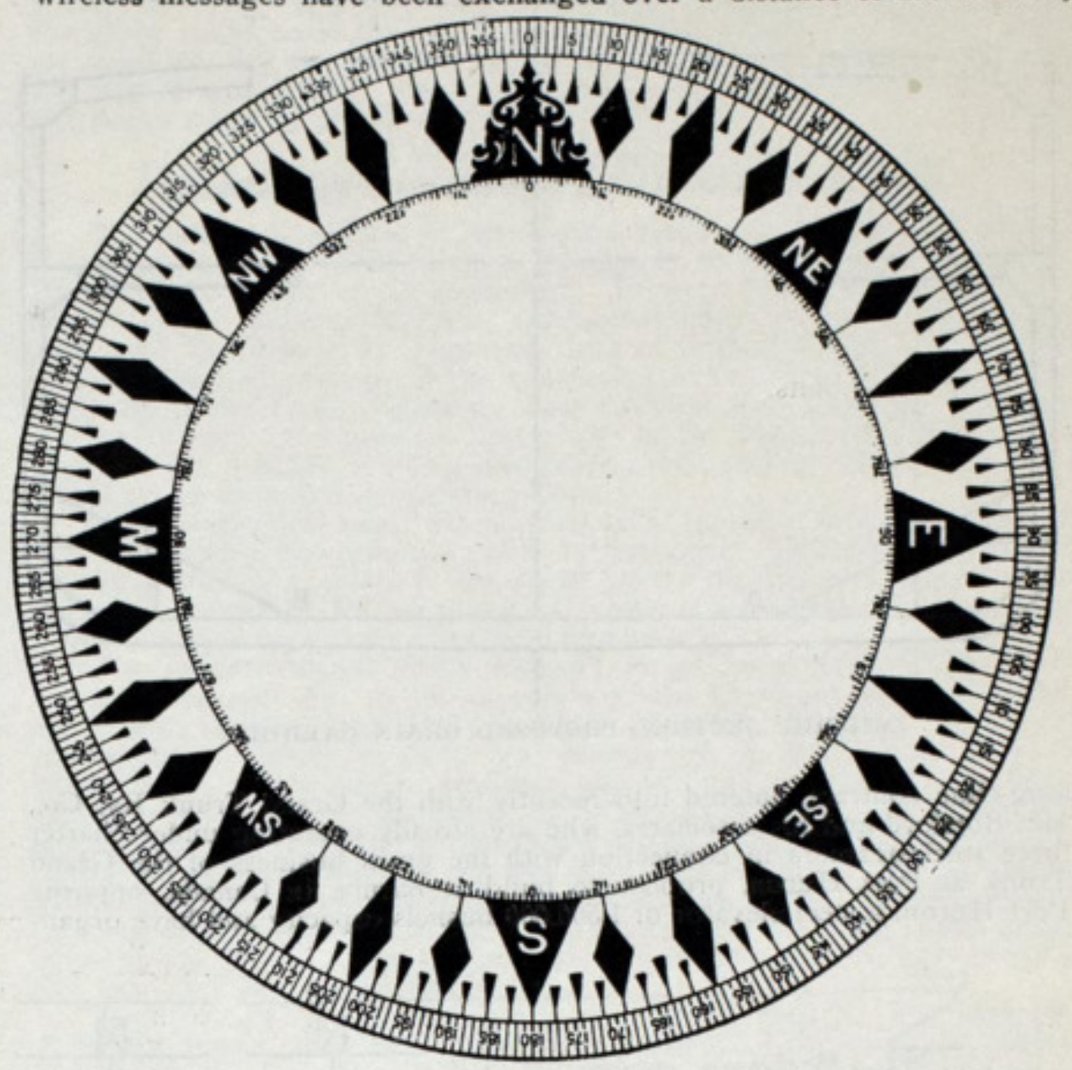
The annual report of Rear Admiral R. B. Bradford, chief of the bureau of equipment, is quite exhaustive. Discussing the naval station at Hawaii, he says:

"No facilities for equipment or other work exist at the present naval station at Honolulu. As a coal depot it has been of the greatest value since the time of the late war. There is storage accommodation for 20,000 tons of coal with only moderate handling facilities. Two excellent wharves and two slips, capable of accommodating the heaviest draught ships, have been fully completed during the present year and have, during construction, and since completion, been of much service, both to naval vessels, army transports and merchant ships. During the present year much thought and attention has been given to securing a good site for a naval station at Pearl harbor, just west of Honolulu. This harbor constitutes the most available and in fact the only good harbor in the Hawaiian group. Its importance was recognized by the last congress in its appropriation of $150,000 to acquire land for a naval station and harbor and channel defense. Efforts were made to obtain prices and options on the lands recommended as a site for the naval station from the owners, but entirely without success. Under instructions from the department, the acting commandant of the naval station, Hawaii, was directed to institute proceedings in July in the proper court for the condemnation of about 800 acres of land in and about Pearl harbor necessary for the naval station. It is believed that these lands, if acquired, will furnish adequate facilities for the development of a first-class naval station and place the government on a good footing for the repair and maintenance of all vessels coming or operating in Central Pacific waters."

On the subject of coal, he says: "Continuing its policy of the past three years, the bureau has transported American coal from the Atlantic coast to distant ports of the world for the use of United States ships of war wherever suitable storage for the same can be obtained. In addition to the amounts transported in navy colliers, about 50,000 tons have been laid down at Manila by chartered vessels, mostly foreign, during the year. The cost of the latter has averaged $8.63 per ton as against $7.80 per ton for the fiscal year 1900 and $6.92 per ton for the fiscal year 1899. Freights generally during the year were expensive, although at present they are very cheap. The naval coal depot at Honolulu has been kept well stocked. It is exceedingly difficult at present to obtain freight for American coal to this port, since it can only be carried in American ships. As foreign ships cannot obtain cargo at Honolulu the importation of Cardiff coal is also expensive. The combination of the two renders coal at this station considerably more costly than formerly."

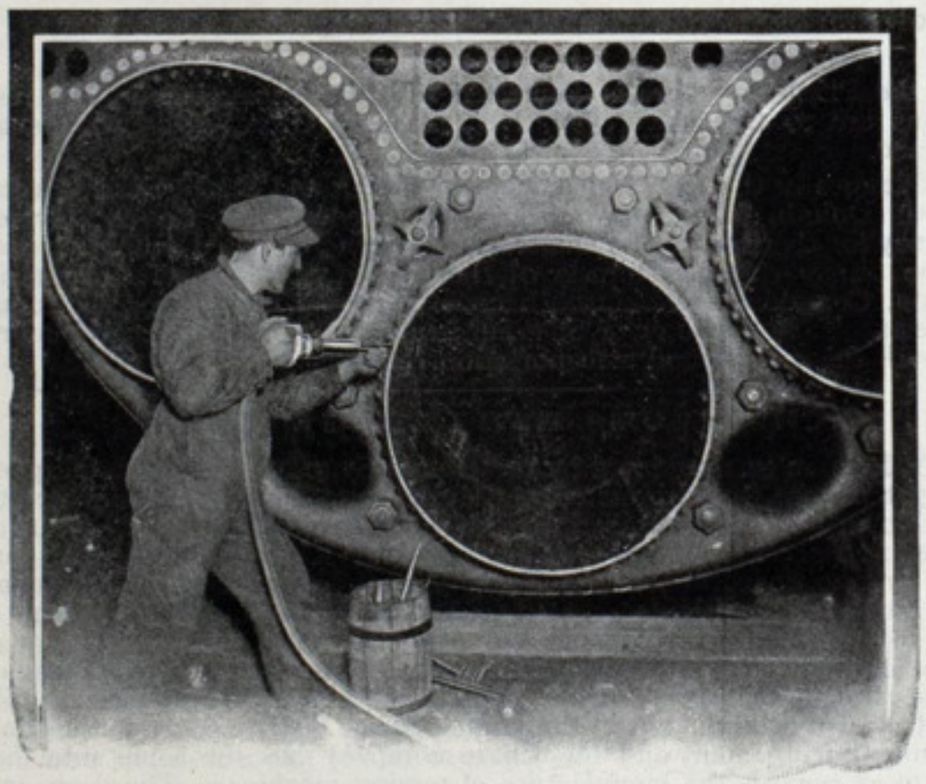
The admiral speaks in high terms of the hydrographic office. He says that in no year during its existence has there been such a demand for its publications as during the present. The bureau is sadly in need of additional room. Discussing the subject of wireless telegraphy, the admiral says:

"There appears to be little doubt that the Marconi apparatus has been considerably improved during the past year. Claims are made that the difficulty of interference can be overcome, but the bureau is not aware that any positive exhibition or demonstration has been made to this end. Practical improvements have been made in the ærial wire by grounding it through the primary of an induction coil. It has just been stated that wireless messages have been exchanged over a distance of 186 miles by



the use of the Marconi apparatus; also that reports have passed between British war ships at a distance of 160 miles. Several of the largest transatlantic steamers have had Marconi's apparatus installed on board and its use is generally attracting the attention of the commercial world. Most of the principal naval powers have adopted some form of wireless telegraphy for their ships. Great Britain and Italy use the Marconi system,

"Little Giant" Pneumatic Hammers



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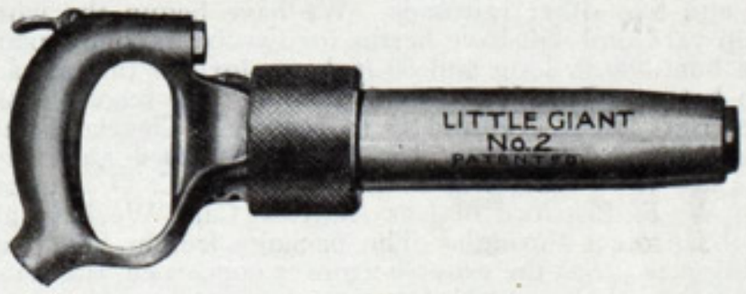

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Germany the Slaby system and France and Russia the Dueretet system. It is believed, however, from the reports received that none are satisfactory. Claims of superiority are made for certain features adopted by some of the American wireless companies. For example, the De Forest system includes the use of a motor generator for transmission, by the aid of which it is expected to obtain a mechanical tuning between the sending and receiving stations and thus avoid interference. It is not believed that this mechanism has passed beyond the experimental stage. Experiments in the same field for the same purpose are being conducted by Mr. Nicola Tesla and the results are awaited with much interest. It does not appear advisable to the bureau to adopt any particular system at present, or to acquire any more apparatus than necessary for purposes of instruction. It is clear that no system has as yet passed beyond the experimental stage."

In the last annual report of the bureau a new type of compass card was described and illustrated. It has excited much attention in the service and elsewhere among mariners, many letters having been received both commendatory and otherwise. The bureau presents another card, which is a combination of the new and old and which can be conveniently used for degrees or points. "It is hoped that the service will thoroughly criticise both types," says the admiral. "There is no doubt of the necessity of some change in order to facilitate the very accurate navigation necessary for modern high-speed ships. It is believed that courses should be laid down, steered and recorded in degrees, and convenient appliances are necessary for that purpose."

SHIP BUILDING ON THE SEABOARD.

SUMMARY OF WORK IN THE MAINE YARDS — SEVERAL LAUNCHES HAVE OCCURRED AND A FEW NEW CONTRACTS ARE NOTED.

The ship yards of Maine, building mostly wooden craft, have launched this year 44,621 tons of new vessels for the merchant fleet, including two steel ships, and a fine lot of four-masted and five-masted schooners, and the builders have contracts in hand for almost an equal amount of tonnage. Fewer barges have been built than formerly, the fancy of owners seeming to lean more and more to large schooners. Maine launched two six-masted schooners last year and this year some five-masters nearly as large. Next year two more six-masters will be built and possibly three, but as yet no one has given a contract for a seven-master such as is now building at the works of the Fore River Ship & Engine Co., Quincy, Mass. In Maine they regard the six-master as the limit. No barks or barkentines have been built in recent years, and no brig has been built in Maine or anywhere else in the eastern United States since the Telos was launched at Bangor in 1883. Very few small schooners are now built, except for the fishing fleet. At Bath this year, in addition to the merchant fleet, there have been launched for the United States navy the cruiser Cleveland, the monitor Nevada and the torpedo boat Biddle, and a battleship, the Georgia, is now in process of construction there. The prospect for the coming year is bright, many of the yards being already occupied with frames for new vessels, while many orders are on hand. Percy & Small of Bath closed a contract a few days ago to build for J. S. Winslow & Co. of Portland a six-masted schooner of the same size as the Eleanor A. Percy, about 3,400 gross tons, the Percy being at present the largest schooner afloat. There is a total of new work on hand at Bath of 23,200 tons. At Waldoboro a six-masted schooner will be built, and at Rockland, Camden and Thomaston large schooners will be built, ranging in size from 1,000 to 2,500 tons. At Bangor, where no vessels of any account have been built in the last ten years, a four-masted schooner, a two-masted schooner and a steamer will be built. Never in the last twenty years have the builders of yachts and small boats been so rushed with orders, and in general there is more work than can be turned out on contract time. It is a time of great prosperity for every one connected with the ship yards, sail lofts and machine shops, and there is every prospect that the activity now prevailing will continue for a considerable period. Wages were never better for all classes of labor, and there is no sign of dissatisfaction anywhere except among the sailmakers at Bath, where recently there has been a strike for a nine-hour day at the pay that has been given for ten hours.

A steam yacht building for W. S. Spaulding and J. T. Spaulding, from designs by J. Beaver Webb of New York, was launched this week from the ship yard of T. S. Marvel & Co., Newburgh, N. Y., and christened the Isis. The Isis is built of steel and is 200 ft. over all, 24 ft. beam, and has a draught of 11 ft. 6 in. She will have three staterooms forward and six abaft the engine. The yacht will be towed to the plant of the W. & A. Fletcher Co., Hoboken, N. J., where her engines will be installed.

The John N. Robins Co., Erie basin, Brooklyn, N. Y., has secured a contract to build a schooner-yacht for F. M. Smith of San Francisco, Cal. The yacht will have a water line length of 122 ft. 9 in., and will be 153 ft. 7 in. over all with a beam of 17 ft. 6 in. and a depth of hold of 9 ft. 8 in. The machinery will consist of a four-cylinder triple-expansion engine and two water-tube boilers. Her speed under natural draft will be 17½ miles an hour and under forced draft 20 miles an hour.

The Harlan & Hollingsworth Co., Wilmington, Del., is building a deep-sea cruising schooner for a New York yachtsman whose name at present is withheld. The yacht will be 110 ft. on the water line, 140 ft. over all, 26 ft. beam and 14 ft. draught. Her engines will be of the compound type, having cylinders of 8 and 16 in. diameter and 12 in. stroke. The boilers will be of the Almy water-tube type, made by the Almy Water-Tube Boiler Co., Providence, R. I.

The new steam schooner South Bay was launched a few days ago from the works of the Tacoma Ship Building Co., Tacoma, Wash. She will be fitted with machinery in San Francisco. The keel of a new barkentine for J. J. McKinnon of San Francisco for the lumber trade was laid this week by the Tacoma company. She will cost $60,000. Her dimensions are: Length, 210 ft.; beam, 40 ft.; depth of hold, 16 ft.

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In a brick mill the flues are built into one of the side walls. The apparatus in the basement forces heated air through duct connecting with bases of flues. Outlet dampers above head level on each floor control admission.

ITEMS OF GENERAL INTEREST.

W. I. Adams, East Boothbay, Me., has a small freighter well along, the planking being about finished, deck timbers all in and deck soon to be laid.

Fred S. Nock, West Mystic, Conn., has taken an order to build a 60-ft. auxiliary sloop yacht for Wilbur C. Fiske of New York. The yacht will be propelled by a gasoline motor.

The Long Island City Machine & Construction Co. has in frame a tug for the Newtown Creek Towing Co. The new boat is 87 ft. in length, 20 ft. beam and 9½ ft. deep. The engine will be 20 by 24 in.

It is announced that the drawings are all complete for a new steel steamer for the Hudson River Day Line, to ply between New York and Albany. She will be built on the same lines as the New York of the same line, but will have four decks, two saloon decks and an observation deck above the main deck. She will be 400 ft. long.

A large steel towboat, Peter Sprague, building at the Iowa Iron Works, Dubuque, Ia., for the Monongahela Consolidated Coal Co., Pittsburg, Pa., was launched a few days ago. The dimensions of the towboat are as follows: Length, 275 ft.; length including the 40-ft. diameter wheel, 318 ft.; width, including 22-in. guards, 64 ft. 8 in.; depth at shallowest part, 7 ft.; depth at bow, 10 ft., and at stern, 12 ft.; draught, 5 ft. She will be equipped with nineteen engines for every kind of use. There are six Hopkins patent boilers, 14 ft. long and 7 ft. diameter with 129 4-in. tubes each.

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1891	68,247	68,331	204									
1892	68,247	68,403	69,822	23,259								
1893	68,379	68,343	68,286	68,247								
1894	68,439	68,367	68,574	68,439	37,701							
1895	68,673	68,766	68,739	68,808	40,887	28,713						
1896	69,534	92,718	69,696	69,549	62,205	63,153	40,716					
1897	68,250	69,606	92,736	69,555	62,235	76,110	63,357	43,146				
1898	70,938	69,534	69,552	69,597	62,526	63,240	63,240	62,553	63,954	22,707		
1899	69,534	69,615	67,431	90,405	60,246	62,778	62,868	52,344	54,855	44,007	22,884	
1900	69,534	67,494	69,744	69,564	61,719	62,382	62,502	51,471	53,373	62,016	63,066	52,140
Total	757,503	713,637	644,784	597,423	387,519	356,376	292,683	209,514	172,182	128,730	85,950	52,140

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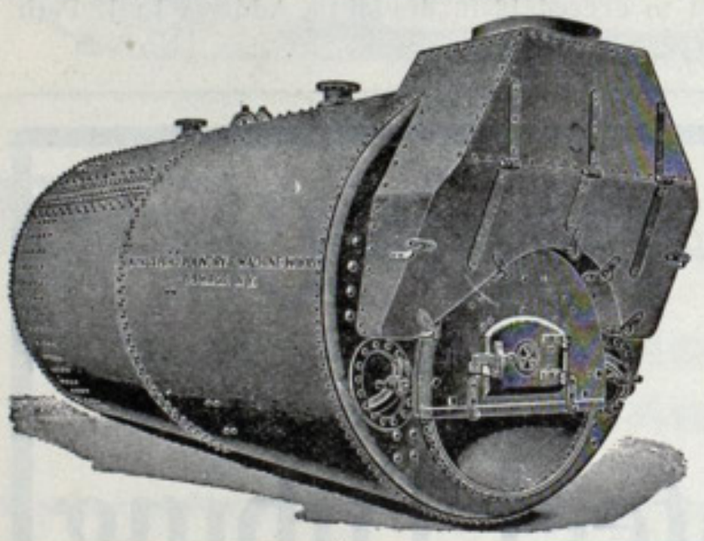

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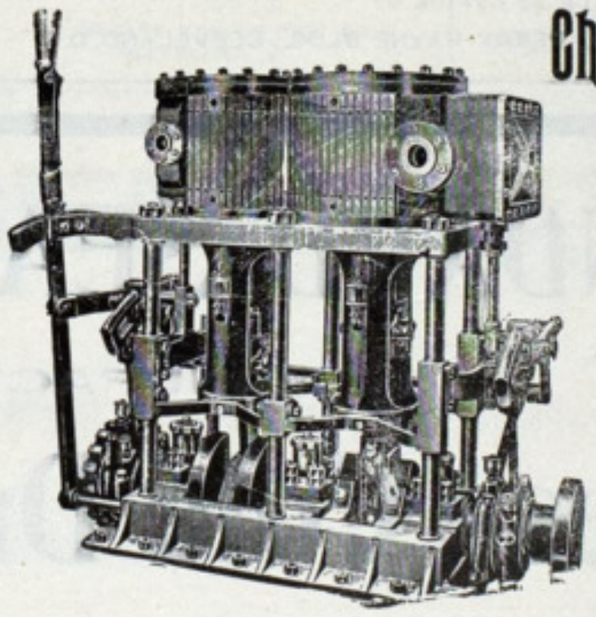

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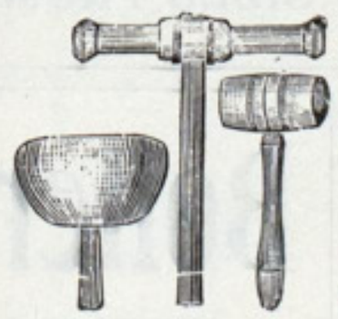

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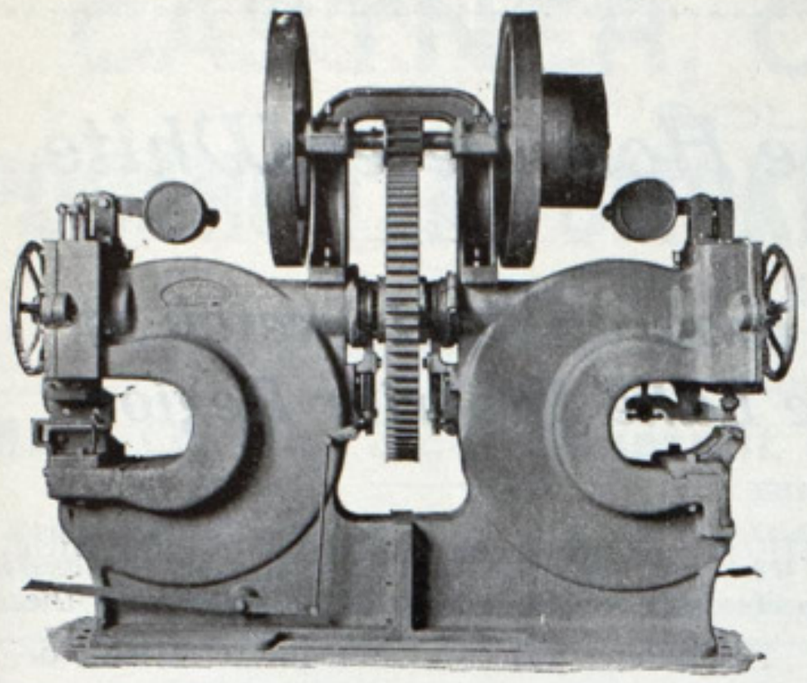

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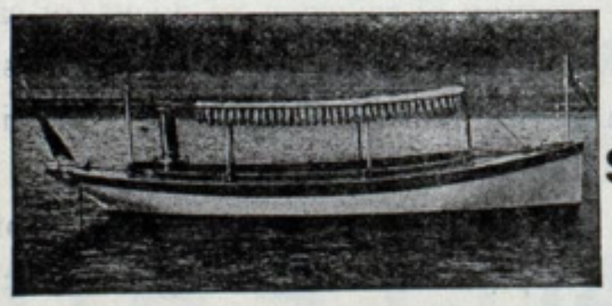

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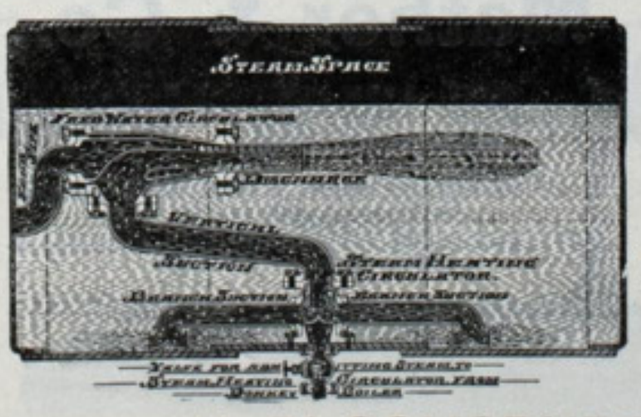

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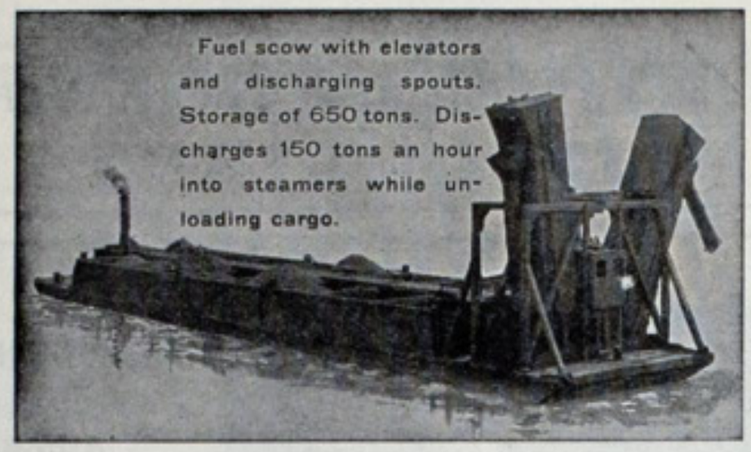

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ELECTRIC HOISTS AND CRANES.

Elwell-Parker Electric Co.....Cleveland.
Fort Wayne Electric Works.....Fort Wayne, Ind
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York
Westinghouse Electric & Mnfg. Co.....Pittsburg, Pa.

ELECTRIC STEERING GEAR, SPEED AND RUDDER INDICATORS, ETC.

Electro-Dynamic Co.....Philadelphia.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Ship & Engine Co.....Quincy, Mass.
Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated.....New York.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Lake Shore Engine Works.....Marquette, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Building Co..Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Olds Motor Works.....Detroit.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mnfg. Co.....Milwaukee.
Standard Ship Building Co.....Perth Amboy, N. J.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Willard, Chas. P. & Co.....Chicago.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.
Electro-Dynamic Co.....Philadelphia.
Seidler-Miner Electric Co.....Detroit.

ENGINEERING SPECIALTIES AND SUPPLIES.

Crane Co.....Chicago.
Reilly Repair & Supply Co., James.....New York.

ENGINEERS, MARINE AND MECHANICAL.

Electro-Dynamic Co.....Philadelphia.
Gaskin, Edward.....Buffalo.
Holmer & Goodenough.....New York.
Hunt, Robt. W. & Co.....Chicago
Miller, Walter.....Cleveland.
Pittsburgh Testing Laboratory, Ltd.....Pittsburg.
Powell, Ambrose V.....Chicago.
Roelker, H. B.....New York.
See, Horace.....New York.
Wood, W. J.....Chicago.

EVAPORATING AND DISTILLING APPARATUS.

Reilly Repair & Supply Co., James.....New York.

FANS FOR VENTILATION, EXHAUST, ETC.

American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.
Reilly Repair & Supply Co., James.....New York.
Smith, W. Blackburn.....Perth Amboy, N. J.

FIXTURES FOR LAMPS, OIL AND ELECTRIC.

Page Bros. & Co.....Boston.
Porter's Sons' Co., Wm.....New York.

FOG SIGNALS.

Colt Co., J. B.....New York.
Hamilton-Foster Fog Signal Co.....New York.

FORGES.

Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.

Cleveland City Forge & Iron Co.....Cleveland.
Fore River Ship & Engine Co.....Quincy, Mass.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

FURNACES FOR BOILERS.
Continental Iron Works.....New York.

FUELING COMPANIES AND COAL DEALERS.
Castner, Curran & Bullitt (Pocahontas)....Philadelphia.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co.....Buffalo.
Smith, Stanley B. & Co.....Detroit.
Youghiogheny & Lehigh Coal Co.....Chicago.

GAS BUOYS.
Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.
Chase Machine Co.....Cleveland.
Lake Shore Engine Works.....Marquette, Mich.
Olds Motor Works.....Detroit.

GAGES, STEAM AND VACUUM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

GRAPHITE.
Dixon Crucible Co., Joseph.....Jersey City, N. J.

GRAPHITE BUSHINGS AND BEARINGS.
Graphite Lubricating Co.....Bound Brook, N. J.

HAMMERS, PNEUMATIC.
Standard Pneumatic Tool Co.....Chicago.

HAMMERS, STEAM.
Bement, Miles & Co.....Philadelphia.
Chase Machine Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.

HATCH GEARS.
"Long Arm" System Co.....Cleveland.

HAWSERS, WIRE.
American Steel & Wire Co.....Chicago.

HEATING APPARATUS.
Sturtevant, B. F. Co.....Boston.

HOISTS FOR CARGO, ETC.
American Ship Building Co.....Cleveland.
Brown Hoisting Machinery Co., Incorporated..Cleveland.
Chase Machine Co.....Cleveland.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....New York.
Hodge, S. F. & Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mnfg. Co.....New York.
Marine Iron Co.....Bay City.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

HOSE FOR PNEUMATIC TOOLS.
Sayen & Schultz.....Philadelphia.

HYDRAULIC MACHINERY.
Bement, Miles & Co.....Philadelphia.
Watson-Stillman Co., The.....New York.
Wood & Co., R. D.....Philadelphia.

ICE MACHINERY.
Roelker, H. B.....New York.

INDICATORS FOR STEAM ENGINES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

INJECTORS.
Crane Co.....Chicago.
Jenkins Bros.....New York.

INSURANCE, MARINE.
Brown & Co.....Buffalo.
Chamberlain & Co., S. R.....Chicago.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Helm, D. T. & Co.....Duluth, Minn.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
Mitchell & Co.....Cleveland.
Osborn, F. H. & Co.....Chicago.
Parker, A. A. & W. B.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.
Tandy, Frank N.....Boston.

IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

LATHES OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.
Pratt & Whitney Co.....Hartford, Conn.

LAUNCHES—NAPHTHA, ELECTRIC.
Gas Engine & Power Co.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.
Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.
Page Bros. & Co.....Boston.
Porter's Sons' Co., Wm.....New York.

LOGS.
Walker & Sons, Thomas.....Birmingham, Eng.
Also Ship Chandlers.

MACHINE TOOLS (WOOD WORKING).
Atlantic Works, Inc.....Philadelphia.

MACHINE TOOLS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.
Pond Machine Tool Co.....Plainfield, N. J.
Pratt & Whitney Co.....Hartford, Conn.

MALLETS FOR CAULKERS, BOILER MAKERS, ETC.
N. Y. Mallet & Handle Works.....New York.

MARINE RAILWAYS, BUILDERS OF
Crandall & Son, H. I.....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.
Lein, Irvine & Co.....New York.

MECHANICAL DRAFT FOR BOILERS.
American Blower Co.....Detroit.
American Ship Building Co.....Cleveland.
Bloomsburg & Co., H.....Baltimore, Md.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Detroit Shipbuilding Co.....Detroit.
Sturtevant, B. F. Co.....Boston.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.
Cramp, Wm. & Sons.....Philadelphia.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.

METAL POLISH.
Bertram's Oil Polish Co.....Boston.

MILLING MACHINES OF ALL KINDS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.

NAUTICAL INSTRUMENTS.
Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

NAUTICAL SCHOOL.
Chicago Nautical School.....Chicago.

NAVAL ARCHITECTS.
Gaskin, Edward.....Buffalo.
Holmer & Goodenough.....New York.
See, Horace.....New York.
Wood, W. J.....Chicago.

OAKUM.
Stratford Oakum Co., Geo.....Jersey City, N. J.

OILS AND LUBRICANTS.
Dixon Crucible Co., Joseph.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.
Crane Co.....Chicago.
Garlock Packing Co.....Palmyra, N. Y.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Sayen & Schultz.....Philadelphia.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.

PATENT ATTORNEYS.
Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.
Atlantic Works, Inc.....Philadelphia.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.
Crane Co.....Chicago.

PLANERS OF ALL KINDS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.

PLANING MILL MACHINERY.
Atlantic Works, Inc.....Philadelphia.

PLATE BENDING AND PLANING MACHINES.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Wood & Co., R. D.....Philadelphia.

PLUMBING, MARINE.
Reilly Repair & Supply Co., James.....New York.
Sands, Alfred B. & Son.....New York.

PNEUMATIC TOOLS.
Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston.

POWER DOORS AND HATCHES.
"Long Arm" System Co.....Cleveland.

PRESSURE REGULATORS.
D'Este Co., Julian.....Boston.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Ship & Engine Co.....Quincy, Mass.
Hardy, John B.....Tacoma, Wash.
Hyde Windlass Co.....Bath, Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roelker, H. B.....New York.
Sheriffs Mnfg. Co.....Milwaukee.
Standard Ship Building Co.....Perth Amboy, N. J.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.

PROJECTORS, ELECTRIC.
Badt-Goltz Engineering Co.....Chicago.
Elwell-Parker Electric Co.....Cleveland.
Fort Wayne Electric Works.....Fort Wayne, Ind.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Seidler-Miner Electric Co.....Detroit.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F. Mnfg. Co.....New York.
Kingsford Foundry & Machine Works....Oswego, N. Y.
Wood, R. D. & Co.....Philadelphia.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Wood, R. D. & Co.....Philadelphia.

REFRIGERATING APPARATUS.
American Linde Refrigeration Co.....New York.
Roelker, H. B.....New York.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Automatic Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

RIGGING ROPE (WIRE).
American Steel & Wire Co.....Chicago.

RUBBER GOODS.
Hale Rubber Co., Alfred.....So. Boston, Mass.

RUBBER INSULATED WIRES.
American Steel & Wire Co.....Chicago.
Roebling's Sons, John A.....New York and Cleveland.

SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.
See wrecking companies.

SEARCH LIGHTS.
Badt-Goltz Engineering Co.....Chicago.
Elwell-Parker Electric Co.....Cleveland.
Fort Wayne Electric Works.....Fort Wayne, Ind.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Seidler-Miner Electric Co.....Detroit.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

SHAPERS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.
Pratt & Whitney Co.....Hartford, Conn.

SHEARS.
See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Ship & Engine Co.....Quincy, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Standard Ship Building Co.....Perth Amboy, N. J.
Trigg, Wm. R. Co.....Richmond, Va.
Willard, Chas. P. & Co.....Chicago.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Moran Bros. Co.....Seattle, Wash.
Reilly Repair & Supply Co., James.....New York.
Upson-Walton Co.....Cleveland.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

SOUNDING APPARATUS.
Farr, C. W.....Chicago.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

STEAMSHIP LINES, PASS. AND FREIGHT.
American Line.....New York.
Cleveland & Buffalo Transit Co.....Cleveland.
Clyde Line.....New York.
Dominion Line.....Boston.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL CASTINGS.
Seaboard Steel Casting Co.....Chester, Pa.

STEERING APPARATUS.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Electro-Dynamic Co.....Philadelphia.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mnfg. Co.....Milwaukee.

STOCKS, BONDS, SECURITIES.
Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.
Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

SUBMARINE DIVING APPARATUS.
Hale Rubber Co., Alfred.....So. Boston, Mass.
Schrader's Son, A.....New York.

SURVEYORS, MARINE.
Holmer & Goodenough.....New York.
Gaskin, Edward.....Buffalo.
See, Horace.....New York.
Wood, W. J.....Chicago.

TELEGRAPH—DECK AND ENGINE ROOM.
Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.
Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburg.

THERMOMETERS FOR MECHANICAL PURPOSES.
Helios-Upton Co.....Peabody, Mass.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Pond Machine Tool Co.....Plainfield, N. J.
Pratt & Whitney Co.....Hartford, Conn.
Standard Pneumatic Tool Co.....Chicago.
Watson-Stillman Co.....New York.
Wood, R. D. & Co.....Philadelphia.

TOOLS, WOOD WORKING.
Atlantic Works, Inc.....Philadelphia

TOWING MACHINES.
American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.

TOWING COMPANIES.
Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
Swain Wrecking Co.....Detroit.

TRAPS, STEAM.
D'Este Co., Julian.....Boston.
Haines Co., Wm. S.....Philadelphia.

TRUCKS.
Boston & Lockport Block Co.....Boston.

TUBING, SEAMLESS.
Benedict & Burnham Mnfg. Co.....Waterbury, Conn.
Standard Seamless Tube Co.....Pittsburg.

VALVES, STEAM SPECIALTIES, ETC.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crane Co.....Chicago.
Crosby Steam Gage & Valve Co.....Boston.
D'Este Co., Julian.....Boston.
Jenkins Bros.....New York.
Wood & Co., R. D.....Philadelphia.

VARNISH PAINT.
Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.
Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Chamberlain & Co., S. R.....Chicago.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Hall & Root.....Buffalo.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Kennedy, Hunter & Co.....Antwerp.
Mitchell & Co.....Cleveland.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.
Tandy, Frank N.....Boston.

VENTILATING APPARATUS FOR SHIPS.
American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.
American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A.....New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

WINDLASSES.
American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.
American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.
Atlantic Works, Inc.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.
Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.
Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.
Drein, Thos. & Son.....Wilmington, Del.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.
Willard, Chas. P. & Co.....Chicago.

YAWLS.
Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Brooklyn.

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Miller, Walter. 9
Mitchell & Co. 34
Monongahela Iron & Steel Co. 10
*Moran Bros. Co. 39

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*Newhall Chain Forge & Iron Co. 30
Newport News Ship Building & Dry Dock Co. 5
New York Mallet & Handle Works. 30
Niles Tool Works Co. 3
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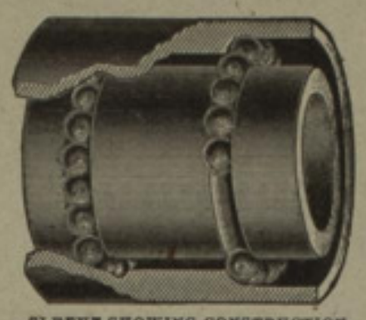

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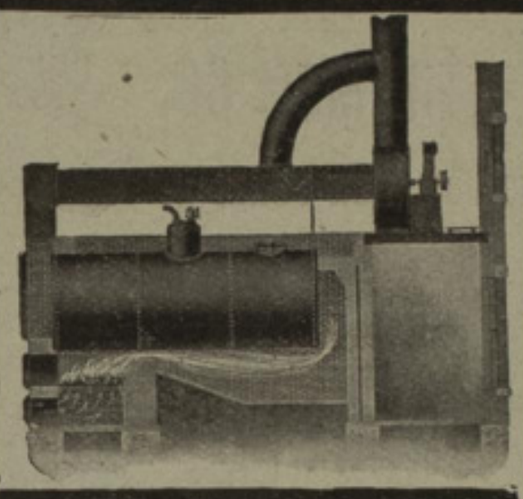

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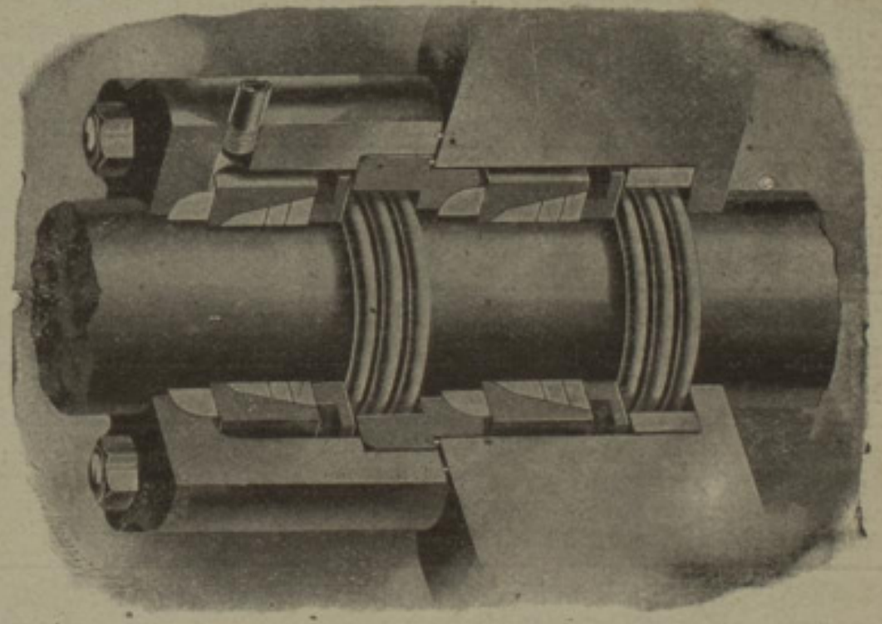

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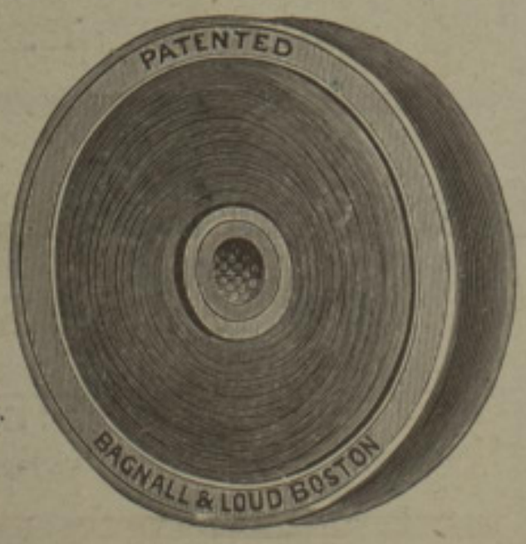

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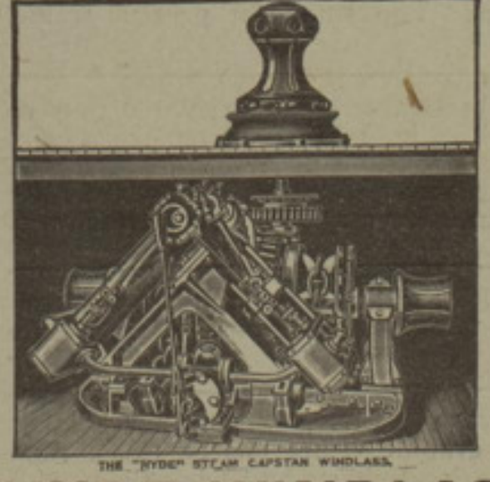

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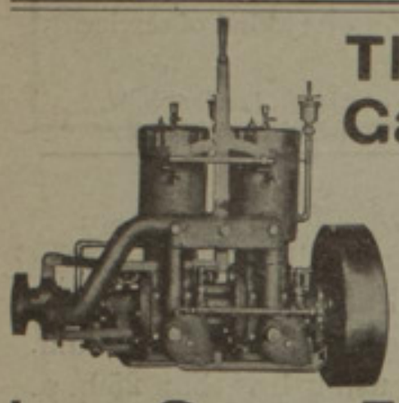

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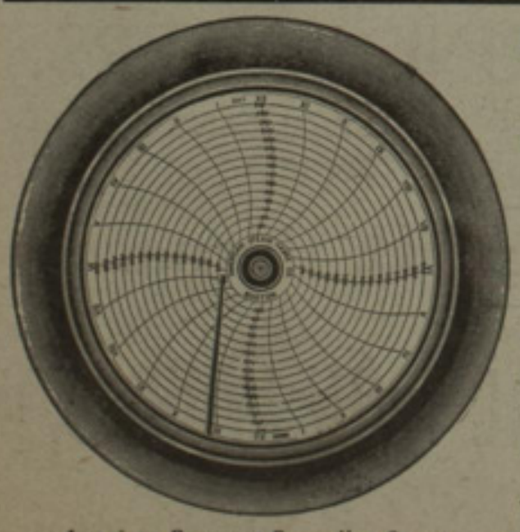

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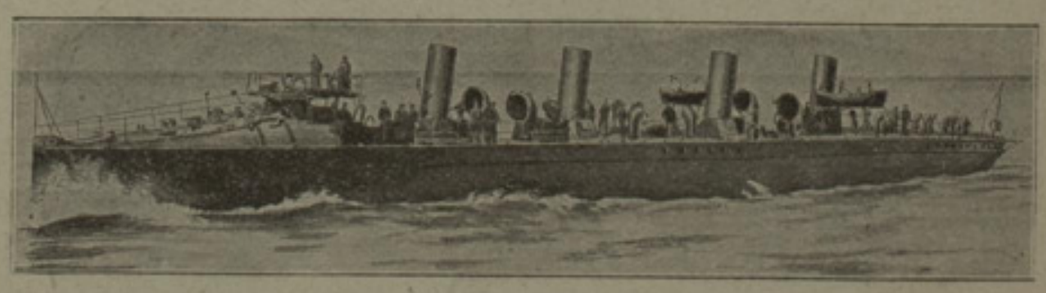

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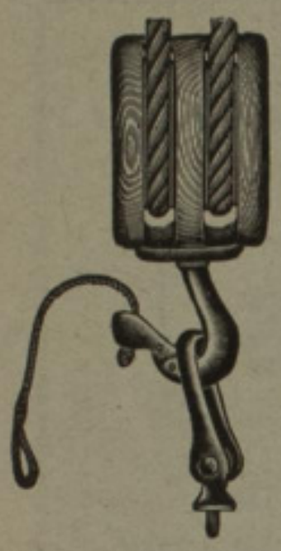

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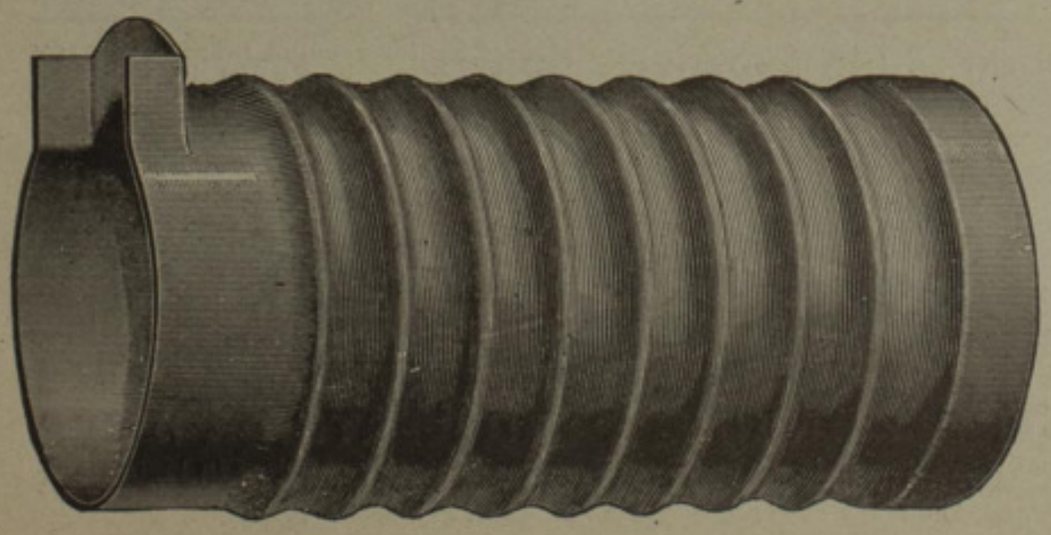

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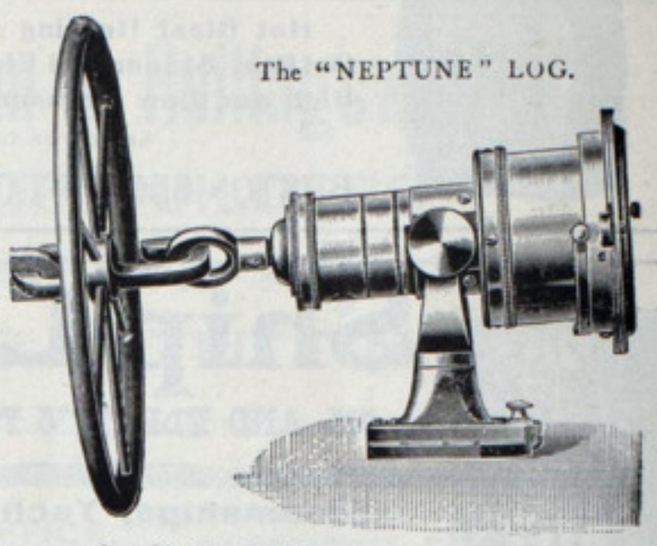

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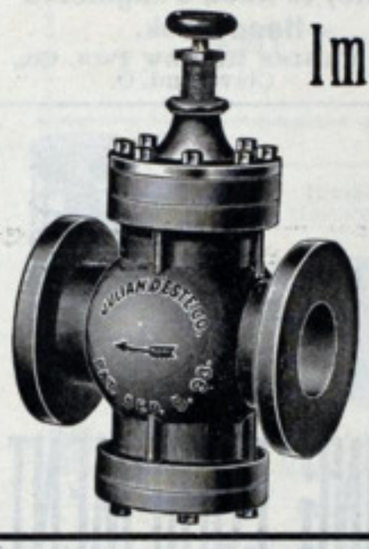

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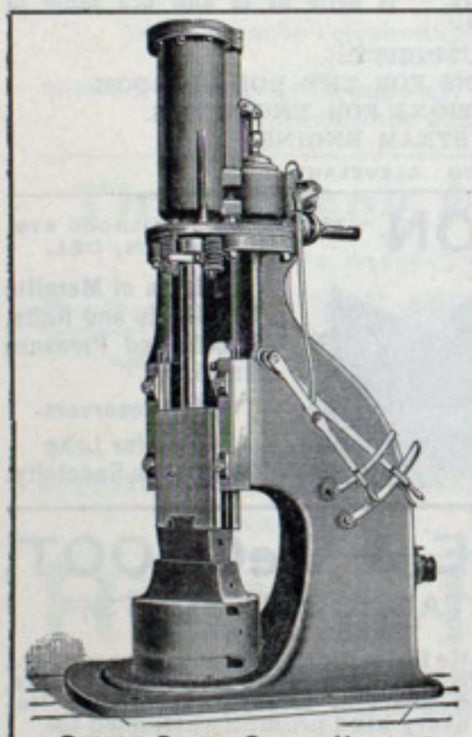

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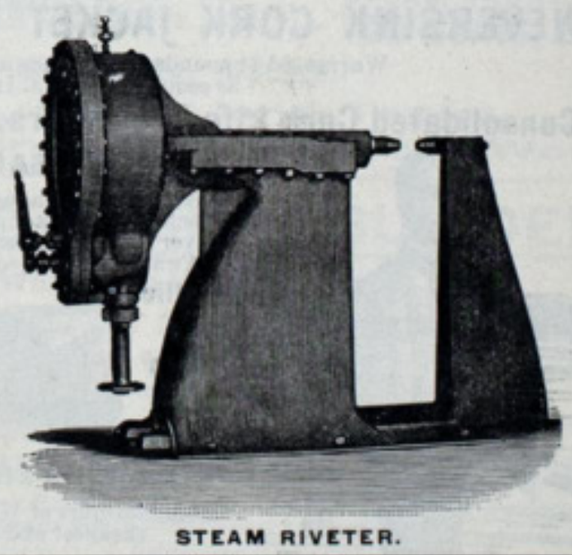

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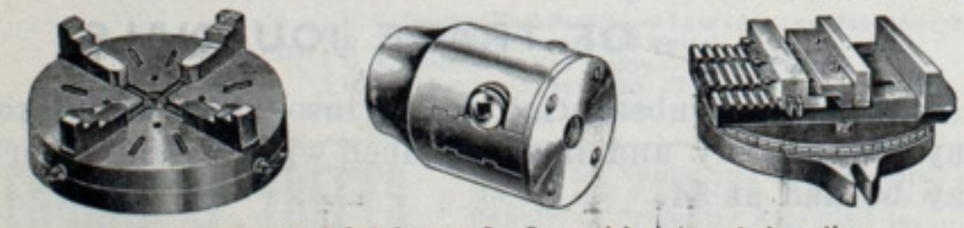

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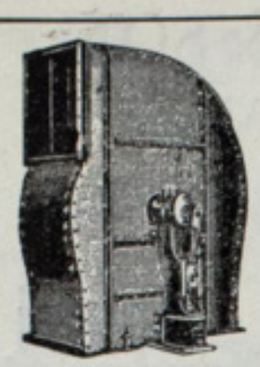

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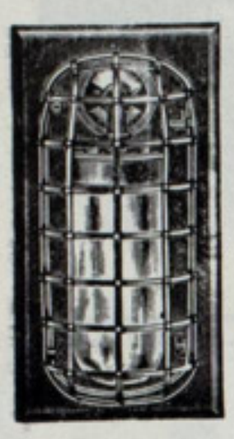

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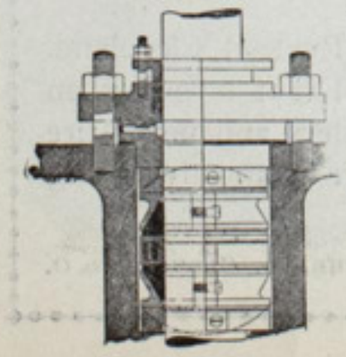

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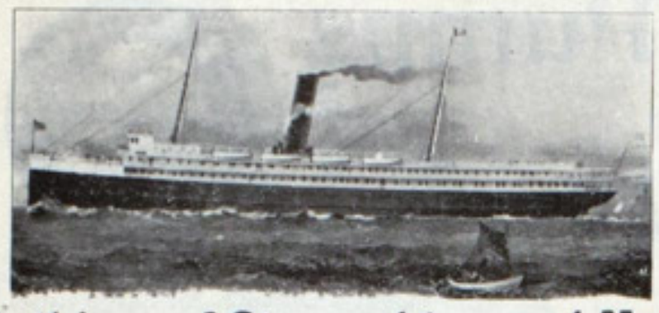

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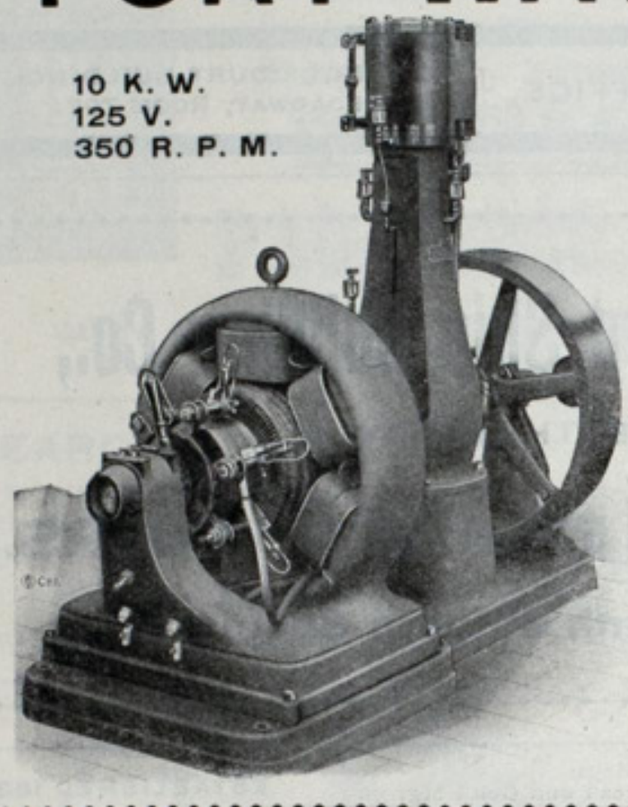

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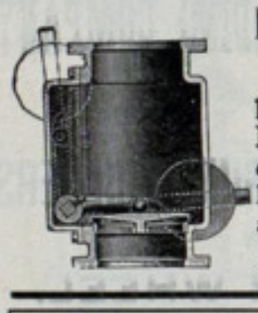

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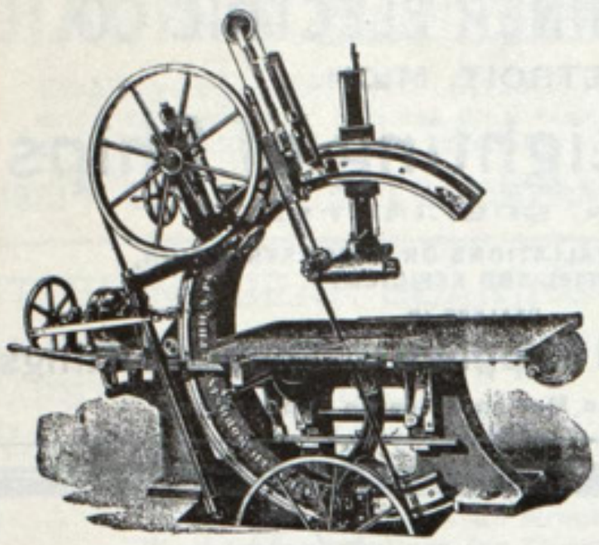

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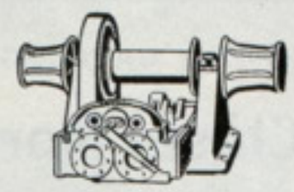

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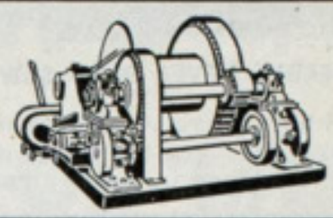

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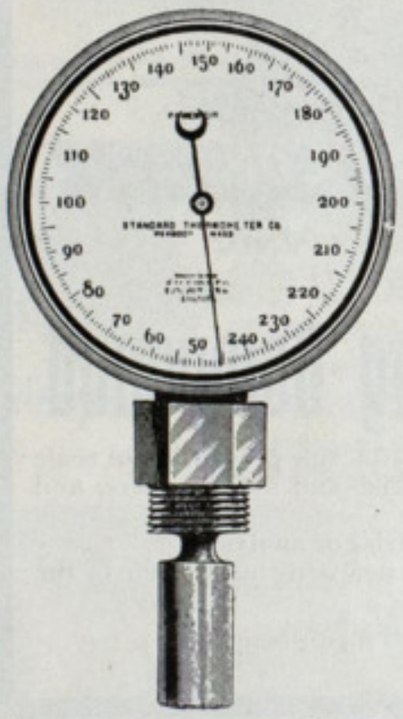

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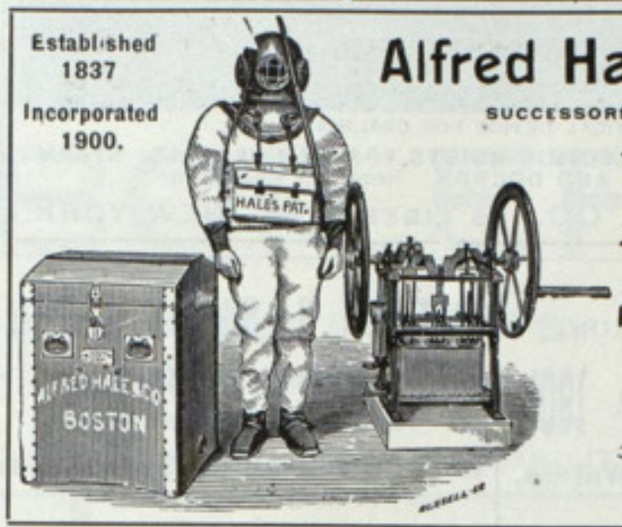

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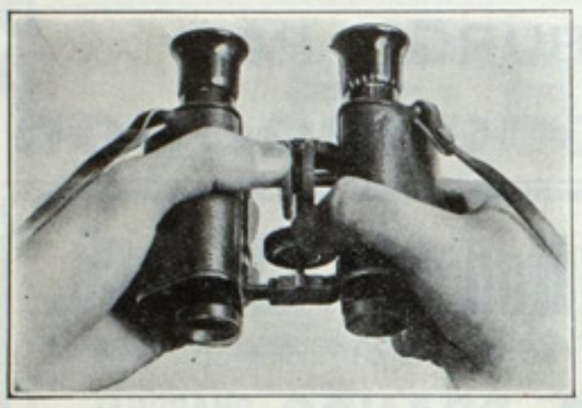

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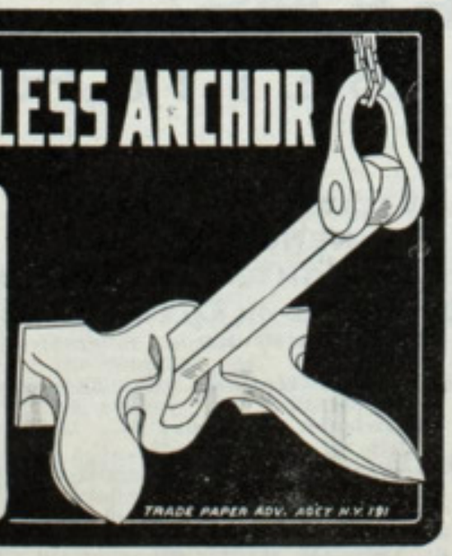

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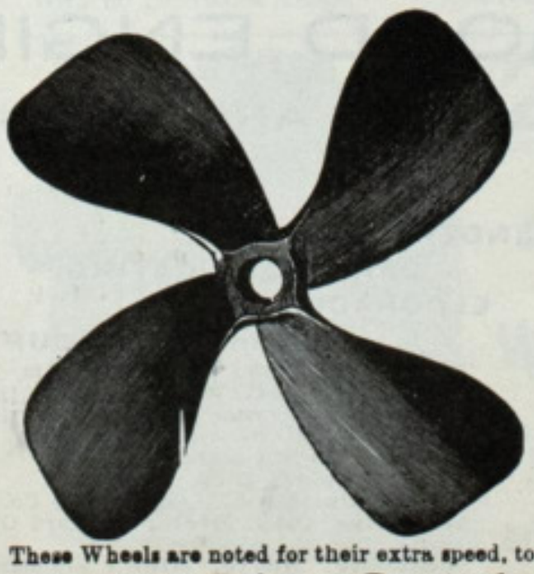

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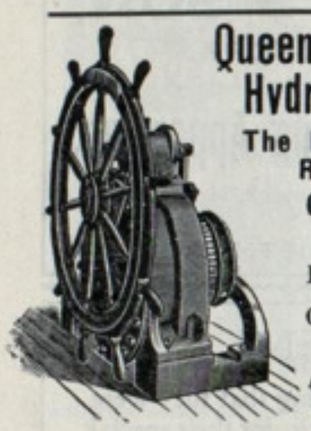

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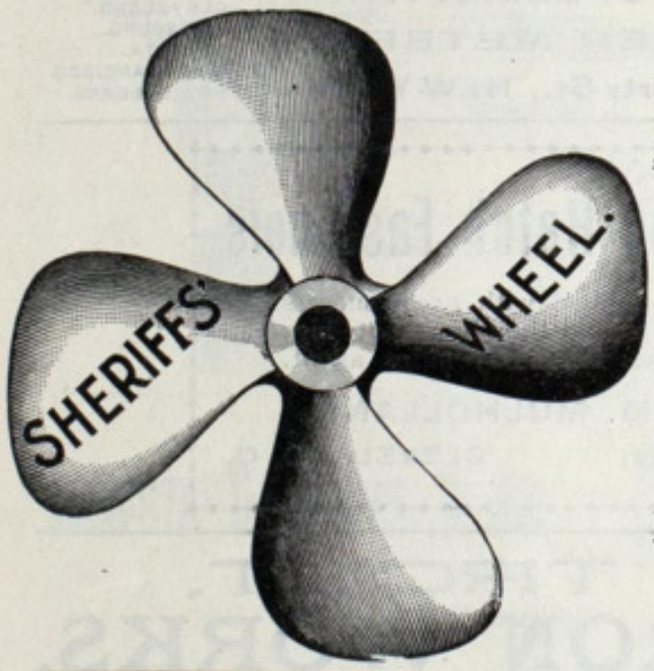

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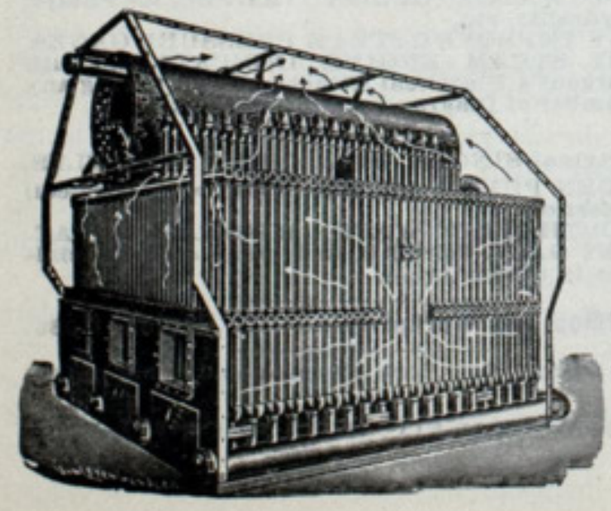

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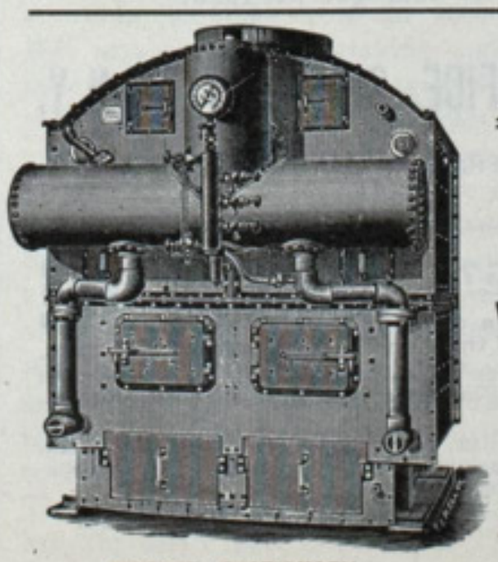

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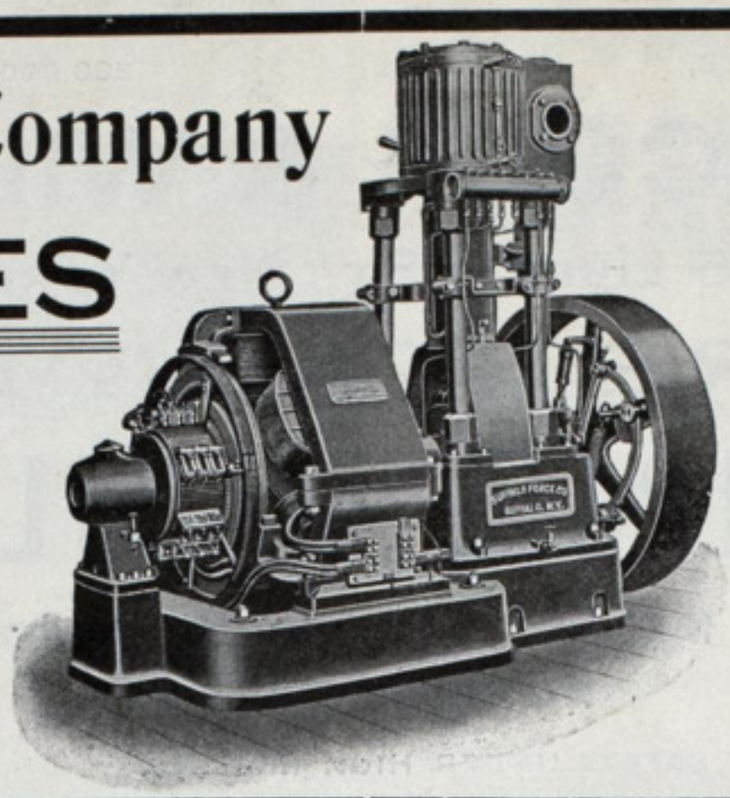

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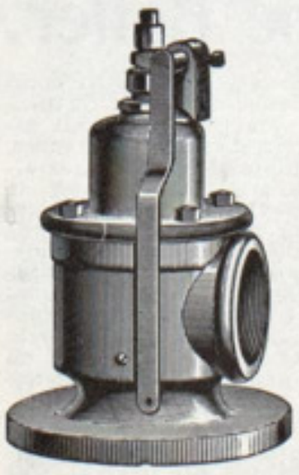

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